



Pronto&2500&5000 Users' Manual 1.5a

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Safety of the GeoDesy-FSO product



The GeoDesy-FSO is classified as Class 3B laser product.

The GeoDesy-FSO System has been tested and found to comply with the

EN 60825-1:1994+A11:96+A2:2001 (laser safety),

EN 60950-1:2001 (electrical safety),

EN 55022:1998+A1:200+A2:2003 Class 3B (emission)

and EN 55024:1998+A1:2001+A2:2003 and EN 61000-6-2:2001 (immunity)

European standards.

The laser radiation is emitted from the transmitter optics through the glass window in the front side of the laser head under less than 10 mrad divergences. No other aperture through which laser radiation can occur present in the laser head.

Warning!

Invisible laser radiation! Looking directly into the laser beam can cause permanent damage to the eye! Safe looking distance varies with beam power and divergence. See attached data sheet for exact figures.

The GeoDesy-FSO product should be installed in such a way that nobody can access the optical window or can get in the way of the laser beam accidentally. For detailed instructions please read chapter 5.3.5 Eye Safety on page 20.

The GeoDesy-FSO product provided with all the necessary labels specified by the standards. Moreover informative labels should be put on clearly visible places where the laser beam can be accessed. The locations of the warning labels are shown on page 20 of the manual (Chapter 5.3.5/Eye Safety).

The Outdoor Interconnection Unit is assembled with a certified power cord, which must be connected to the mains through a power outlet to make the disconnection possible at any time. Any modification to the above installation is prohibited. If modifications are required by the local standard, please contact the manufacturer.

To ensure the compliance with the EN 60950 safety requirements, the system should be installed only by the manufacturer or its certified partners.

Warning!

Operating the GeoDesy-FSO product other than described in this manual can cause undesired laser radiation and can be dangerous to he eye or electrical shock!

Elektrische Sicherheit des GeoDesy-FSO Produkts



Das GeoDesy-FSO ist eine Klasse 3B Lasereinrichtung.

Das GeoDesy-FSO Produkt wurde geprüft und entspricht den Anforderungen der Europäischen Standards EN 60825-1:1994+A11:96+A2:2001 (Lasereinrichtungen), EN 60950-1:2001 (Elektrische Sicherheit), EN 55022:1998+A1:2000+A2:2003 Klasse 3B (EMV, Störaussendung) und EN 55024:1998+A1:2001+A2:2003 sowie EN 61000-6-2:2001 (EMV, Störfestigkeit)

Der Laserstrahl wird von der Sendeoptik durch die Glasscheibe an der Frontseite des Laserkopf mit einer Divergenz von weniger als 10mrad abgestrahlt. Es sind keine weiteren Blenden vorhanden durch die Laserstrahlen auftreten können.

Warnung!

Unsichtbare Laserstrahlen! Nicht direkt in den Laserstrahl schauen, da dies die Augen permanent schädigen kann. Der Sicherheitsabstand variiert mit der Laserleistung und Divergenz des Laserstrahl. Details hierzu sind im Datenblatt nachzulesen.

Das GeoDesy-FSO Produkt muß so installiert werden, daß niemand Zutritt zu der Optik des Laserkopf hat oder zufällig in den Bereich des Laserstrahl kommen kann. Kapitel 5.3.5 auf Seite 20 des Handbuchs enthält ausführliche Anweisungen zum Schutz der Augen.

Das GeoDesy-FSO Produkt ist mit allen notwendigen Warnhinweisen versehen die durch die Standards vorgegebenen werden. Weitergehende Hinweise sollten an gut sichtbaren Stellen angebracht werden wo man sich dem Laserkopf gefahrlos nähern kann. Die Positionen der Warnhinweise sind auf Seite 20 des Handbuchs dargestellt (Kapitel 5.3.5, Schutz der Augen)

Die „Outdoor Interconnection Unit“, die mit einem zertifizierten Netzkabel ausgeliefert wird, muß mit der Stromversorgung verbunden werden, indem der Netzstecker in eine geeignete Netzsteckdose gesteckt wird, womit die Lasereinrichtung auch jederzeit wieder vom Netz getrennt werden kann. Jegliche Modifikationen an der Installation sind verboten.

Falls aufgrund nationaler Vorschriften dennoch Änderungen an der Installation vorgenommen werden müssen, ist vorher der Hersteller zu befragen.

Um die Konformität bezüglich der Elektrischen Sicherheit nach EN60950 sicherzustellen, sollte das System nur vom Hersteller oder seinen zertifizierten Partnern installiert werden.

Warnung !

Die Inbetriebnahme oder der Betrieb des GeoDesy-FSO Produkts, abweichend von den Vorgaben dieses Handbuchs, kann unerwünschte Laserstrahlung verursachen und gefährlich für die Augen werden oder einen elektrischen Schock verursachen.

Sécurité de produit GeoDesy-FSO



Le produit GeoDesy-FSO est classifié dans la catégorie laser 3B.
Le système de GeoDesy-FSO a été testé et correspond aux normes européennes:
EN 60825-1:1994+A11:96+A2:2001 (sécurité du laser),
EN 60950-1:2001 (sécurité électrique),
EN 55022:1998+A1:200+A2:2003 Classe 3B (émission),
EN 55024:1998+A1:2001+A2:2003 et EN 61000-6-2:2001 (immunité).

La radiation laser est émise à partir de l'émetteur optique à travers une fenêtre en verre placée à la tête du laser et a une divergence de moins de 10 mrad. Aucune autre ouverture dans la tête ne peut laisser passer de radiation laser.

Attention!

La radiation laser est invisible! Interdiction de regarder le rayon laser ! Risques graves de lésions pour les yeux! La distance de sécurité pour la vue est variable et dépend de la puissance du rayon et de sa divergence! Consulter la feuille de données ci-jointe pour calculs exacts.

L'installation de produit GeoDesy-FSO doit être faite de sorte que personne ne puisse accéder à la fenêtre optique ou traverser le rayon laser par accident. Pour instructions détaillées, lire la partie Sécurité de l'œil dans le chapitre 5.3.5 du manuel à la page 20.

Le produit GeoDesy-FSO possède la totalité des étiquettes stipulées par les normes. De plus, des avis informatifs sont placés à des endroits clairement visibles où le rayon laser pourrait être accessible. Une liste des endroits où sont placés les avis informatifs est donnée dans le chapitre 5.3.5 du manuel (Eye Safety) à la page 20.

Le boîtier de connections extérieure (Outdoor Interconnection Unit) est fournit avec un fil électrique certifié par lequel l'appareil est connecté à la prise de courant. Grâce à cela, il est possible de débrancher à n'importe quel moment. Il est formellement interdit d'apporter de quelconques modifications à cette installation. Si une modification est cependant nécessaire à cause des normes locales, contacter le fabricant.

Attention!

Tout opération consistant à utiliser le produit GeoDesy-FSO de façon différente que celle indiquée dans le manuel pourrait engendrer des effets indésirables du rayon laser, être dangereuse pour la vue et provoquer un choc électrique!

Sicurezza dei prodotti GeoDesy-FSO



GeoDesy-FSO è classificato di essere un Classe 3B prodotto di laser.

Il sistema GeoDesy-FSO è stato collaudato e trovato conforme con EN 60825-1:1994+A11:96+A2:2001 (sicurezza sul prodotti laser), EN 60950-1:2001 (sicurezza elettrica), EN55022:1998+A1:200+A2:2003 Class B (emissione) ed EN 55024:1998+A1:2001+A2:2003 ed EN 61000-6-2:2001 (immunità), Norme Europee.

La radiazione laser viene emessa dalla ottica del trasmettitore via la finestra di vetro posizionata sulla fronte della testa di laser con una divergenza minore di 10 mrad. Non esiste nessun' altra apertura attraverso quale radiazione di laser può presentarsi.

Avvertimento!

Radiazione laser invisibile! Guardando direttamente nel raggio di laser può causare danni permanenti degli occhi! La distanza di sicurezza dello sguardo varia secondo la potenza e la divergenza dello raggio di laser. Distanza di sicurezza viene comunicato sulla pagina tecnica allegata.

Prodotti GeoDesy-FSO devono essere installati in tale maniera, che nessuno possa accedere la finestra ottica o esporsi al raggio di laser per caso. Per informazioni più dettagliati vedi la parte Sicurezza Occhi del capitolo 5.3.5 nel manuale sulla pagina 20.

I prodotti GeoDesy-FSO verranno forniti con tutte segnalazioni previste nelle norme. In addizione segnalazioni informative devono essere posizionate nei posti ben' visibili dove il raggio di laser può essere accesso. Le locazioni delle segnalazioni di sicurezze sono dimostrati sulla pagina 20 del manuale (Capitolo 5.3.5/ Sicurezza Occhi)

La Unità Interconnessione Esterna (Outdoor interconnection Unit) viene fornita con un cavo di alimentazione certificato quale deve essere collegato con la rete di potenza tramite una presa per assicurare la separabilità in qualsiasi momento. Qualunque modifica sul questo impianto è proibito. Se modifiche si devono eseguire per rispettare la norma locale, si prega di contattare il produttore.

Per garantire la conformità con la norma EN 60950, il sistema deve essere installato dal produttore o dai partner certificati.

Attenzione!

Qualsiasi operazione di GeoDesy-FSO diversa di quello descritto in questo manuale può causare non desiderata radiazione laser e può essere pericoloso per gli occhi o causare scossa elettrica!

1 Table of contents

1	<i>Table of contents</i>	6
2	<i>Introduction</i>	8
2.1	What is FSO?	8
2.2	Optical Free-space Transmission	10
2.3	Typical applications	11
2.4	About Geodesy	12
2.5	GeoDesy-FSO PRONTO series.....	12
2.6	GeoDesy-FSO GD2500 series.....	13
2.7	GeoDesy-FSO GD5000 series.....	14
3	<i>Product grouping by interface type</i>	16
3.1	100Mbps TP interface.....	16
3.2	100Mbps Fast-Ethernet systems with TC interface.....	17
3.3	E1 interface systems.....	18
3.4	E2 interface systems.....	19
3.5	E3 Interface systems	20
3.6	STM 1 systems.....	21
4	<i>Product matrixes</i>	22
4.1	Interface matrix	22
4.2	Power supply configuration	22
5	<i>Content of the package</i>	23
5.1	Contents of a GeoDesy-FSO PRONTO link.....	23
5.2	Contents of a GeoDesy-FSO GD-2500 link.....	24
5.3	Contents of a GeoDesy-FSO GD-5000 link.....	25
6	<i>Sites of installation</i>	26
6.1	Key factors of operation	26
6.2	Preferred installation sites	27
6.3	Distance measurement.....	28
6.4	Direct sunshine	28
7	<i>Eye safety</i>	28
8	<i>The mounting bracket</i>	30
8.1	Fixing High-End product range brackets.....	30

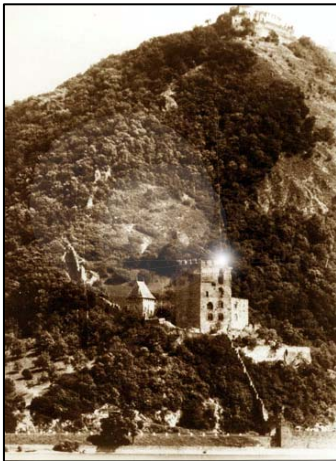
9	System installation	32
9.1	On the table test	32
9.2	PRONTO systems	34
9.2.1	What is PRONTO about?.....	34
9.2.2	How can you install the ODIU?.....	34
9.2.3	Fixing the heads	38
9.2.4	Alignment of the heads	39
9.2.5	Connecting to your Network.....	45
9.2.6	Connecting to the management.....	46
9.3	GD-2500 systems	48
9.3.1	What is GD-2500 about?	48
9.3.2	How can you install the ODIU?.....	48
9.3.3	Fixing the heads	52
9.3.4	Alignment of the heads	52
9.3.5	Connecting to your Network.....	58
9.3.6	Connecting to the management.....	59
9.4	GD-5000 systems	61
9.4.1	What is GD-5000 about?	61
9.4.2	How can you install the ODIU?.....	61
9.4.3	Fixing the heads	65
9.4.4	Alignment of the heads	66
9.4.5	Connecting to your Network.....	72
9.4.6	Connecting to the management.....	73
	Outdoor interconnection unit with Heater	75
9.5	48 VDC Power supply connections.....	76
	Warranty conditions.....	77

2 Introduction

2.1 What is FSO?

FSO is free space optics provides point-point broadband communications using Laser Light as the transmission medium.

FSO is a state of art data communication method which is based on a very old communication solution. Ancient Chinese developed a protection system against the Mongol tribes, building watchtowers within the line of site to other towers. And as soon as the towers saw some hostile sign on the horizon they use they shield to reflect the sun to the remote towers. In this way the area could be prepared against the attack in a very short period of time.



In the ancient times for this communication use the mirror as a transmitter and the sunlight was the light source, and the receiver was the remote guard's eye. This basic signalling method was developed later into up communication device which used „line coding”. This allowed the guards to tell the number of enemy, or the direction they are coming from.

Current **FSO** systems use a laser-diode as a light source, and a receptor diode (photo diode) to receive the signals coming from the laser diode from the transmitter side. But the basic elements are still the same: line of site between the communication nodes, and individual line coding. It is all about performance.

GeoDesy-FSO offers **FSO** systems with the highest power budget available on the market.

Why is it important?

Because of in the ancient Chinese times, the rain, the fog, or even the cloudy weather, could impact the operation of the whole system.

In the **FSO** units, comprising light source and receiver the cloud problem was solved, but development conditions still can impair performance. To go throw the rain, the fog, or snow you need more and more power to be seen from the remote side. Achievable power levels are limited by a number of factors including eye safety.

In this way there is no other choice to see more than „training the eye”. Making the receiver more and more sensitive to sense delight emitted from the remote side.

GeoDesy-FSO offers high transmit power and also



very hard receiver sensitivity. These two factors combined to provide one of the best performing **FSO** systems on the market today.

To meet the demands for every higher bandwidth, **GeoDesy-FSO** continues to invest heavily in research and development with the newest product line which offers Gigabit speeds being launched.

This manual describes the **GeoDesy-FSO GD** series of free space laser transmission system.

The **GeoDesy-FSO GD** product range offers cost effective reliable free space laser transmission for two Mbps up to 1000 Mbps data to the air, where a clean line of site is available. It delivers the most effective point-to-point connection between computer networks or telephone exchanges.

No need for installing cables, no rental costs, no licensing requirements.

Ideal for urban areas or city centres, where the use of these lines are expensive. Suitable for factories or industrial environments where high noise level can interfere with the transmitted data. The best choice to make a connection across rivers and other natural or artificial obstacles, where cable is not available.

The transmission technique used in the **GeoDesy-FSO FSO** devices provides transparent and wire-speed data transfer with virtually zero latency. Because they use infrared light as the transmission medium, **GeoDesy-FSO** system do not require frequency licenses and the transmission is not effected by electro-magnetic or radio-frequency interference. Basically the **GeoDesy-FSO** link can be considered as a virtual fibre in the air, which ends in real fibre optic cable at both ends.

Our product is built using high quality components for operation in even the most adverse conditions.

Metal housing gives robust, waterproof environment for the electronics.

The shield protects the device from direct sunlight and provides extra air isolation.

The **GeoDesy-FSO GD** systems comprise two laser-heads and the two indoor interconnection units (OIU) - one at each end. The interface connections are housed in the outdoor unit together with the PSU of the system.

Best practises were employed in cost engineering throughout the development of **GeoDesy-FSO**.

2.2 Optical Free-space Transmission

The principle used in free space laser transmission is very similar to the one is used for fibre optic transmission. The difference is while fibre optic devices use electronics and optics optimized for transmission to the air. Also one can observe to the similarity in the transmission properties. No galvanic contact, no ground-loops, no need for surge protection, noise immunity, long distances, high bandwidth.

What makes it unique – and difficult to design – is that it does not require any transmission medium like fibre or copper, but it has to cope with the dynamically changing parameters. For instance while the attenuation of an optical fibre is constant, the attenuation of the atmosphere between the laser units can change dramatically (depending on the weather conditions).

The laser-heads are usually placed on top of building, where the clean line of site is guaranteed and the beam cannot be interrupted.

In the head the incoming signal is amplified, encoded, and then drives the laser-diode. The transmitter optics assures the proper beam shape and controls the beam divergence. The receive optics perceives and directs the transmitter signal to the photo diode. The diode converts it back into electrical, than it is decoded, amplified and converted.

There are several things that can influence the quality of transmission. We can classify those factors into three main groups.

System conditions - transmitting power, transmitter's wavelength, beam divergence, receiver optics diameter, receiver sensitivity, parameters of optical system and casing. These parameters determine the system's characteristic at a certain distance and are controlled by system design and factory set up.

Weather conditions - molecular absorption, particle scattering and turbulence. These elements have great effect on the operational conditions of the system. We do not have very much influence on them; proper product selection can eliminate the undesirable effects.

Environmental conditions - building movements, direct sunlight, refractive surfaces. These are also key factors related to the installation sites and can be controlled by appropriate site survey and system installation

2.3 Typical applications

Most typically the **GeoDesy-FSO-TP** is used to interconnect LAN-s. The system is protocol transparent, thus other applications also can be taken into consideration. Appropriate interface converters are needed and system bandwidth must be matched for that.

Here we collected some circumstances, where the employment of the **GeoDesy-FSO** is the most adequate and cost effective solution.

Those are:

Areas with natural or artificial obstacles



Where cable is actually not an alternative, like across rivers or railways or in rugged terrain.

Urban areas

Where only leased lines are available with limited speed, and high rental cost. With GeoDesy-FSO links you can establish on line LAN-to-LAN connections.



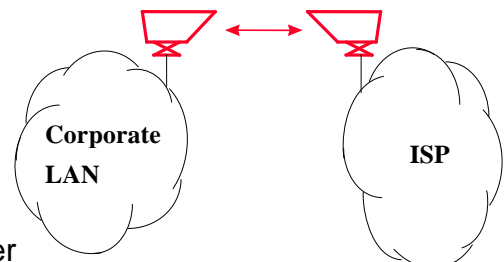
Industrial areas



Where you have noisy environment with high EMI or RFI. Factory buildings, airport objects can be connected through laser link.

ISP connections

Where high bandwidth is required. ISP's can offer high-speed links to their customers or trunks can be established between ISP's instead of expensive leased lines.



2.4 About Geodesy

GeoDesy FSO is part of the GeoDesy Group, with main focus on high speed wireless communication, especially laser-based Free Space Optical (FSO) transmission. *GeoDesy* itself is the successor of the well-known MOM Optical Works in Hungary, with more than 100 years tradition in the field of high-precision optics, prisms, components and instruments for the surveying industry. With production facilities located in Budapest, the solid technical and engineering-background of *GeoDesy* is the key factor in assuring that GeoDesy FSOe products combine the highest technical level with reliable performance, constant product-development and dependable pre- and after-sales service.

Geodesy FSO solutions offer broadband, point to point connectivity enabling wireless networking over and above the current communications infrastructure. Geodesy FSO technology delivers high security, scalability and superior price to performance value and has been successfully deployed for a wide range of applications across sectors as diverse as SP's, ISP's, Health, Education, Finance

Grouping by product name

In this chapter we will give you overview of our products.

2.5 GeoDesy-FSO PRONTO series

The **PRONTO** series products from **GeoDesy-FSO** are laser based free space optical systems designed to provide flexible, reliable and secure solution for high speed wireless connections up to 1500 m. Due to their modular design the equipments are easy and fast to troubleshoot and upgrade in the field. Adjustable transmitter optical system allows custom configuration of the system for specific installations. The patented Aperture Control Mechanism delivers outstanding system availability figures. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments. Furthermore, PRONTO series systems can be ordered with IP based SNMP compatible device management that allows remote control and monitoring of the equipment. Because they use infrared light as transmission medium, **GeoDesy-FSO** systems do not require frequency licenses and the transmission is not affected by electro-magnetic interference. The concentrated laser beam is extremely hard to tap, even to discover since it cannot be detected by spectrum analyzers. Basically, a **GeoDesy-FSO** link can be considered as a virtual fibre in the air.



The **GeoDesy-FSO PRONTO** systems comprise of two Laser Heads (each containing two transmitters), two Outdoor Interconnection Units (ODIU) and two sets of interconnection cables — one at each end. The Laser Heads are installed outdoors, where a clear optical path exists between the two sites. Each head is equipped with heavy duty Alignment Base Unit, which allows exact positioning and

ensures reliable long-term operation of the system. The head assembly features rear and front doors that provide easy access to the internal parts on the field during installation, troubleshooting or upgrade procedures. Next to the head the Outdoor Interconnection Unit provides fast and easy interconnection between the laser head and the cable coming from the network equipment. Moreover the ODIU houses the Power Supply Unit (PSU) of the system and the network interface. The PSU provides the low voltage power required to operate the laser head while the data port offers direct connectivity for standard network equipments. A variety of standard copper and fibre interfaces are available for voice and data applications. The system contains built-in signal monitoring unit, which features a visual signal strength indicator and LINK status information accessible on the rear of the head assembly. The optional IP Based Management Hardware is placed in an Indoor Interconnection Unit (IDIU). The bar graph of the IDU displays the actual signal strength level while the LED indicators show the presence of Minor or Major alarm condition. With the help of the relay contacts an external alarm monitoring equipment may be connected to the system to process the alarm signals further. In addition to the above **GeoDesy-FSO GDView™** software allows the monitoring of the link's operation through a proprietary graphical interface (GUI) via Ethernet or RS-232 ports or a third party SNMP manager via TCP/IP connection. . Industry standard network interfaces and clear upgrade path for higher bandwidth protect the customer's investments in **GeoDesy-FSO** systems. Moreover, **PRONTO** systems offer high level of network flexibility due to their modular design, which makes them ideal to follow network topology changes.

2.6 GeoDesy-FSO GD2500 series

The **GD-2500** series products from **GeoDesy-FSO** are laser based free space optical systems designed to provide flexible, reliable and secure solution for high speed wireless connections up to 2500 m. Due to their modular design the equipments are easy and fast to troubleshoot and upgrade on the field. Adjustable transmitter optical



system allows custom configuration of the system for specific installations. The patented Aperture Control Mechanism delivers outstanding system availability figures. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments. Furthermore, GD-2500 series systems can be ordered with IP based SNMP compatible device management that allows remote control and monitoring of the equipment. Because they use infrared light as transmission medium, **GeoDesy-FSO** systems do not require frequency licenses and the transmission is not affected by electro-magnetic interference. The concentrated laser beam is extremely hard to tap, even to discover since it cannot be detected by spectrum analyzers. Basically, a **GeoDesy-FSO** link can be considered as a virtual fibre in the air.

The **GeoDesy-FSO GD-2500** systems comprise of two Laser Heads (each containing four transmitters), two Outdoor Interconnection Units (ODIU) and two sets

of interconnection cables — one at each end. The Laser Heads are installed outdoors, where a clear optical path exists between the two sites. Each head is equipped with heavy duty Alignment Base Unit, which allows exact positioning and ensures reliable long-term operation of the system. The head assembly features rear and front doors that provide easy access to the internal parts on the field during installation, troubleshooting or upgrade procedures. Next to the head the Outdoor Interconnection Unit provides fast and easy interconnection between the laser head and the cable coming from the network equipment. Moreover the ODIU houses the Power Supply Unit (PSU) of the system and the network interface. The PSU provides the low voltage power required to operate the laser head while the data port offers direct connectivity for standard network equipments. A variety of standard copper and fibre interfaces are available for voice and data applications. The system contains built-in signal monitoring unit, which features a visual signal strength indicator and LINK status information accessible on the rear of the head assembly. The optional IP Based Management Hardware is placed in an Indoor Interconnection Unit (IDIU). The bar graph of the IDIU displays the actual signal strength level while the LED indicators show the presence of Minor or Major alarm condition. With the help of the relay contacts an external alarm monitoring equipment may be connected to the system to process the alarm signals further. In addition to the above

GeoDesy-FSO GDview™ software allows the monitoring of the link's operation through a proprietary graphical interface (GUI) via Ethernet or RS-232 ports or a third party SNMP manager via TCP/IP connection.

Industry standard network interfaces and clear upgrade path for higher bandwidth protect the customer's investments in **GeoDesy-FSO** systems. Moreover, **GD-2500** systems offer high level of network flexibility due to their modular design, which makes them ideal to follow network topology changes.

2.7 GeoDesy-FSO GD5000 series

The **GD-5000** series products from **GeoDesy-FSO** are laser based free space optical systems designed to provide flexible, reliable and secure solution for high speed wireless connections up to 5000 m. Due to their modular design the equipments are easy and fast to troubleshoot and upgrade on the field. Adjustable transmitter optical system allows custom configuration of the system for specific installations. The patented Aperture Control Mechanism delivers outstanding system availability figures. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments. Furthermore, **GD-5000** series systems can be ordered with IP based SNMP compatible device management that allows remote control and monitoring of the equipment. Because they use infrared light as transmission medium, **GeoDesy-FSO** systems do not require frequency licenses and the transmission is not affected by electro-magnetic interference. The concentrated laser beam is extremely hard to tap, even to discover since it cannot be detected by spectrum analyzers. Basically, a **GeoDesy-FSO** link can be considered as a virtual fiber in the air.



The **GeoDesy-FSO GD-5000** systems comprise of two Laser Heads (each containing four transmitters), two Outdoor Interconnection Units (ODIU) and two sets of interconnection cables — one at each end. The Laser Heads are installed outdoors, where a clear optical path exists between the two sites. Each head is equipped with heavy duty Alignment Base Unit, which allows exact positioning and ensures reliable long-term operation of the system. The head assembly features rear and front doors that provide easy access to the internal parts on the field during installation, troubleshooting or upgrade procedures. Next to the head the Outdoor Interconnection Unit provides fast and easy interconnection between the laser head and the cable coming from the network equipment. Moreover the ODIU houses the Power Supply Unit (PSU) of the system and the network interface. The PSU provides the low voltage power required to operate the laser head while the data port offers direct connectivity for standard network equipments. A variety of standard copper and fibre interfaces are available for voice and data applications. The system contains built-in signal monitoring unit, which features a visual signal strength indicator and LINK status information accessible on the rear of the head assembly. The optional IP Based Management Hardware is placed in an Indoor Interconnection Unit (IDIU). The bar graph of the IDIU displays the actual signal strength level while the LED indicators show the presence of Minor or Major alarm condition. With the help of the relay contacts an external alarm monitoring equipment may be connected to the system to process the alarm signals further .In addition to the above

GeoDesy-FSO GDviewTM software allows the monitoring of the link's operation through a proprietary graphical interface (GUI) via Ethernet or RS-232 ports or a third party SNMP manager via TCP/IP connection. .

Industry standard network interfaces and clear upgrade path for higher bandwidth protect the customer's investments in **GeoDesy-FSO** systems. Moreover, **GD-5000** systems offer high level of network flexibility due to their modular design, which makes them ideal to follow network topology changes.

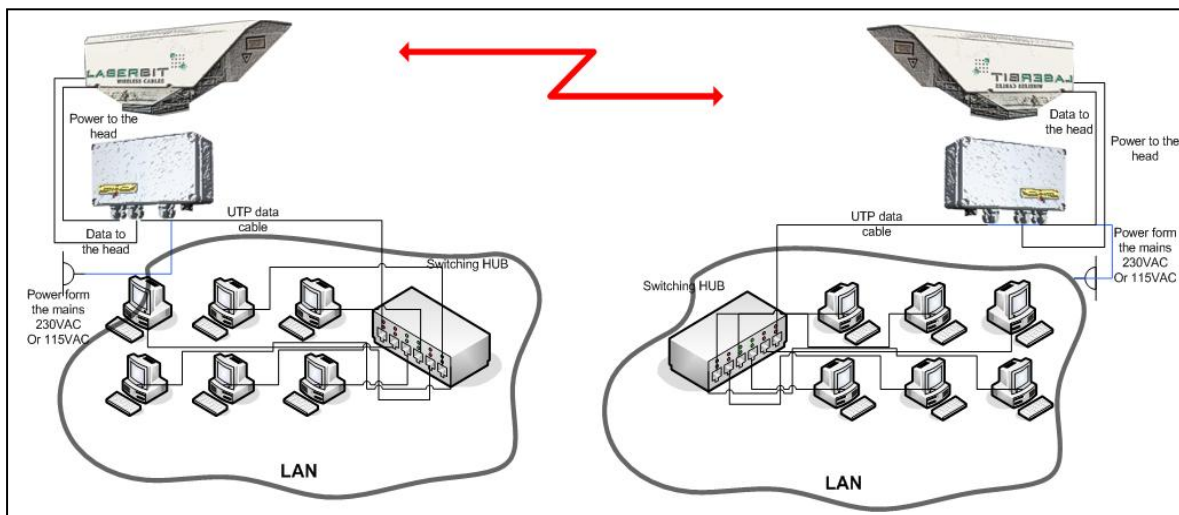
3 Product grouping by interface type

3.1 100Mbps TP interface

The **GeoDesy-FSO TP** series products are designed to provide easy-to-use and cost-effective solution for interconnecting Local Area Networks. By utilizing standard Category 5 cable and using standard 100BaseTX interface the deployment of the system is easier than ever. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments.

The **TP** systems should be considered as repeaters in the network. So the installation distance between the head and the network device is 100m. The distance on a back to back site is maximum 5 meters, between the heads.

The TP system layout



The head needs a power and data cable, which is connected to the ODIU (Outdoor Interconnection Unit). The required power for the outdoor unit is 230VAC or 115VAC, depending on the order. Please note that the transformer is not a switching mode power supply, so has to be configured for the proper voltage before connection, this has to be done before shipment. The heads are fixed 100Mbps and are auto-negotiating.

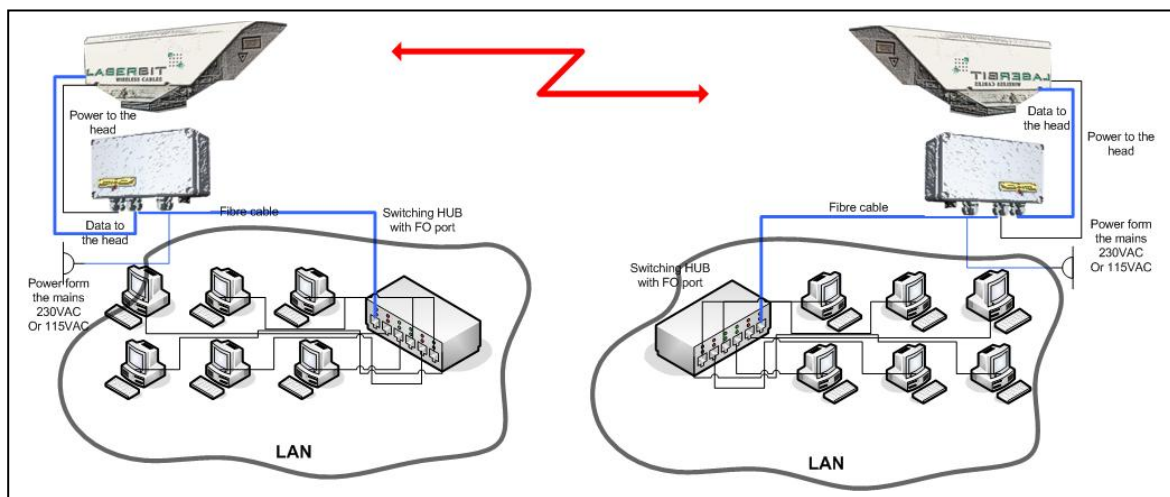
3.2 100Mbps Fast-Ethernet systems with TC interface

GD-TC100 systems are for connecting LAN's on 100Mbps with 100BaseFX connection. Maximum installation distance between the head and the network equipment is 1000meters with MM fibres, and 5000meters with SM fibres. Connecting the fibre cable from the head to the outdoor box and from the outdoor box to the FX/TX converter. Make sure that the converter you using can do the permanent link signal on the FX port.

(**GeoDesy-FSO** do recommend: D-Link DFE-855 Media Converter)

For more instruction of the FX/TX converter please refer the user guide of the converter and for more information contact your local distributor.

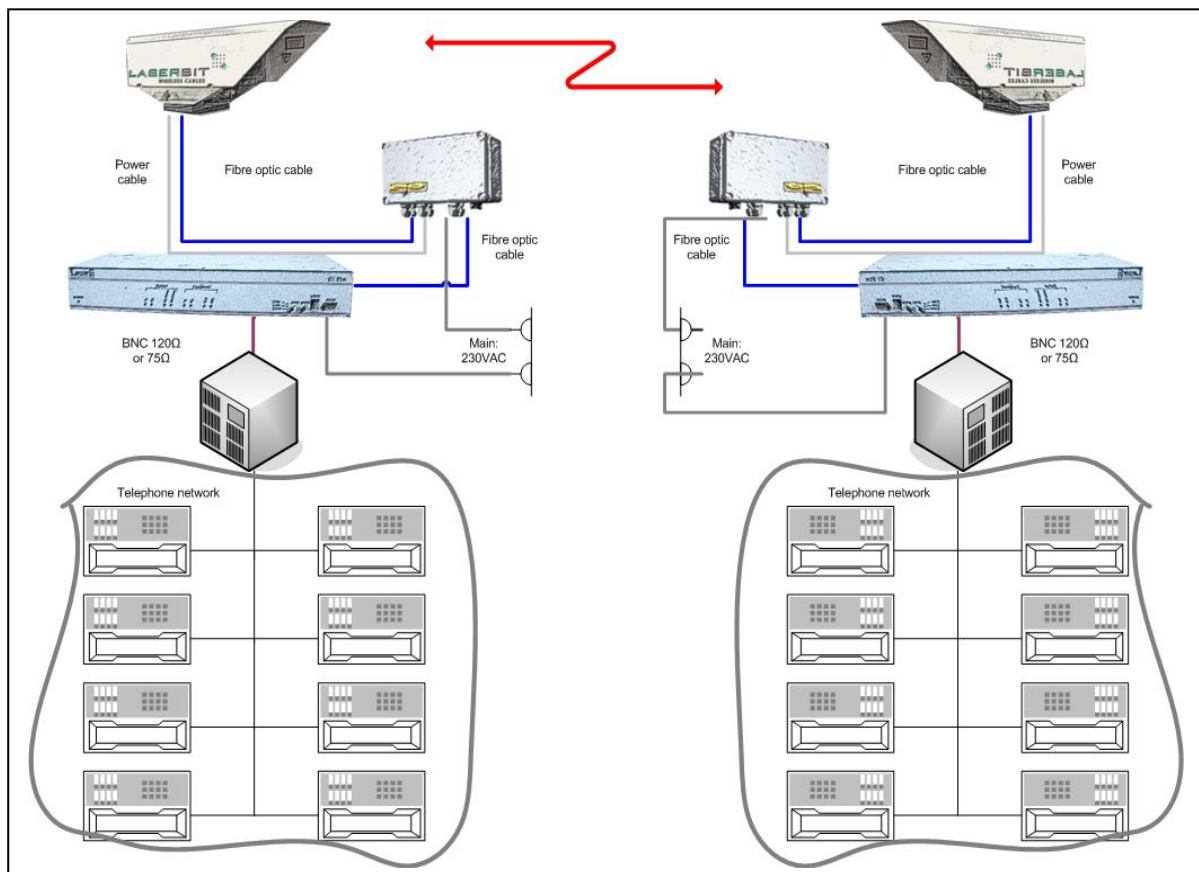
100Mbps Fast-Ethernet systems with FO interface layout



3.3 E1 interface systems

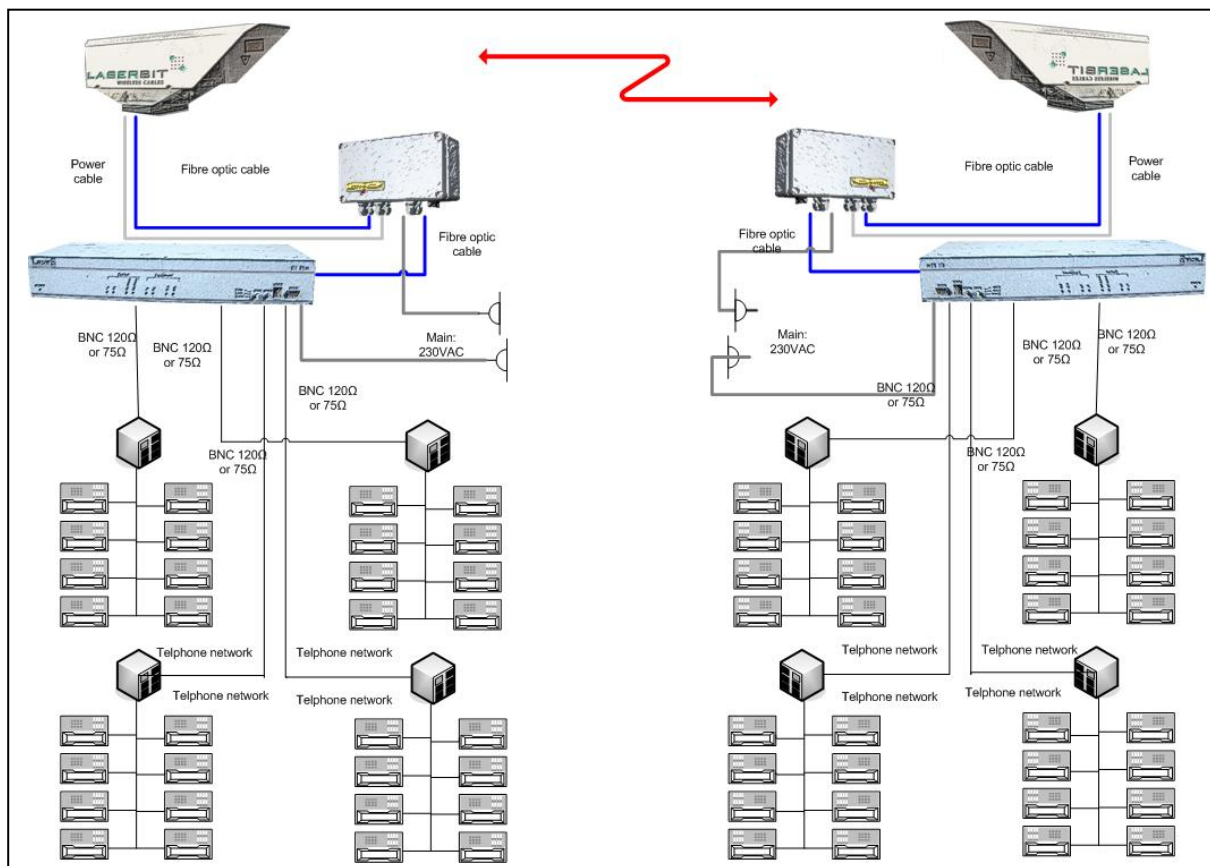
The E1 systems cover the low speed telephony requirements such as connecting Telephone exchanges, up to 30 individual lines. As a part of the system you will receive E1 multiplexers. These multiplexers provide fast and easy connection to the laser device. The TC link speed is 2.048Mbps.

E1 Interface systems layout



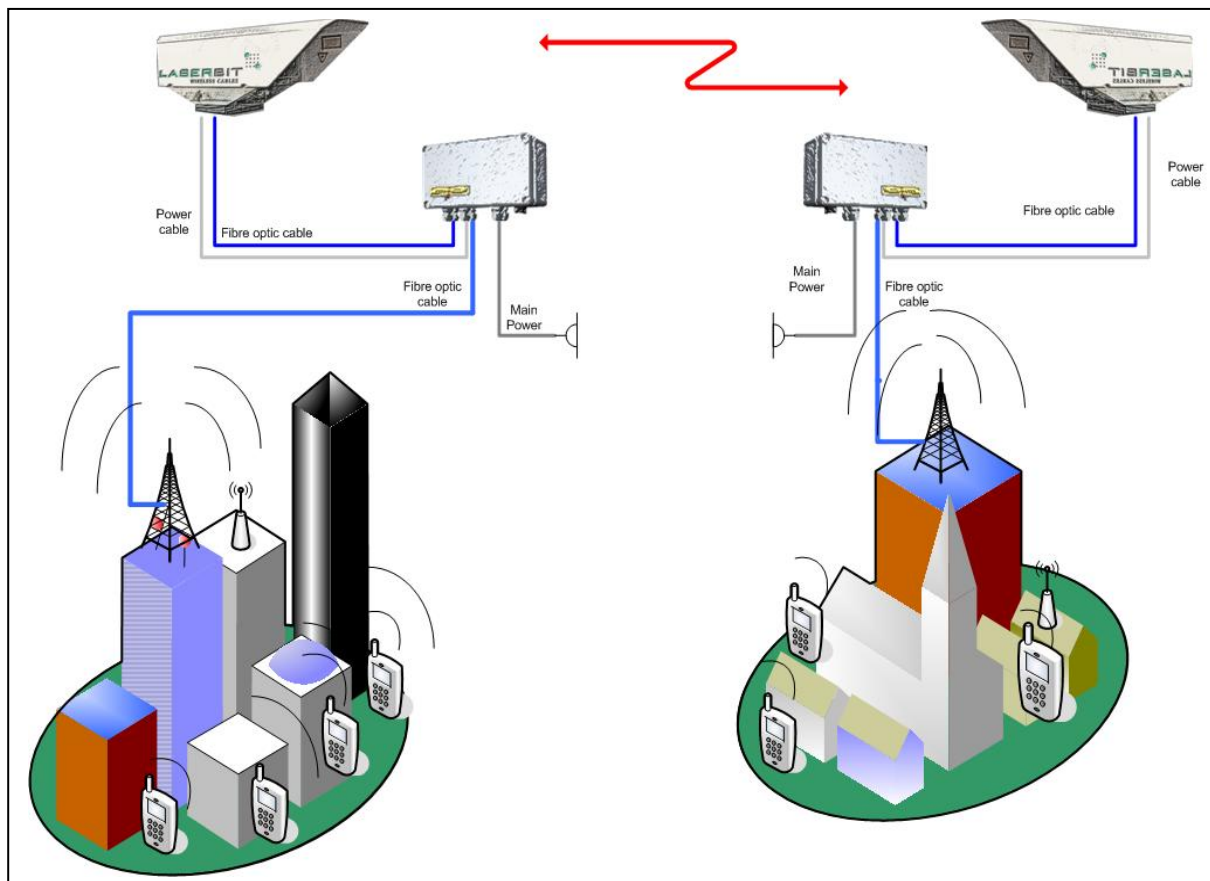
3.4 E2 interface systems

E2 systems provide fast and easy connection for larger phone exchange system on the speed of 8,192Mbps. This allows 120 separated phone lines to be connected over the link. Multiplexers are provided to the link. These multiplexers connect via G703 connection.



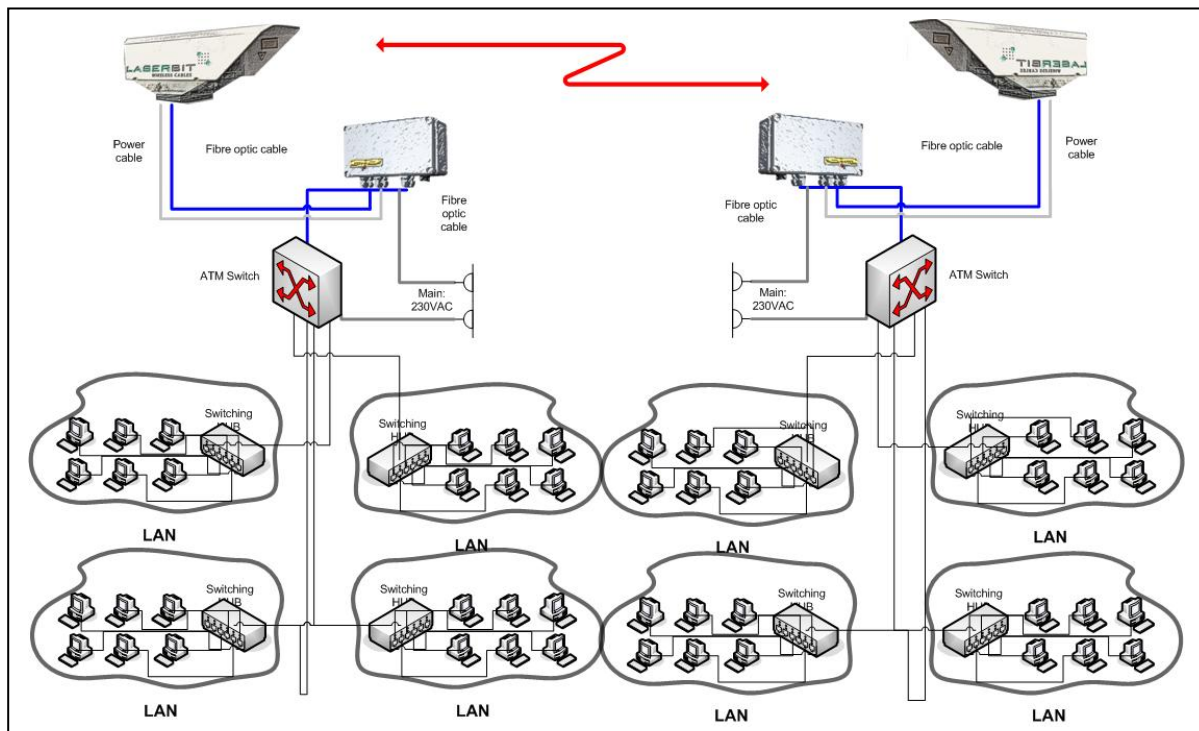
3.5 E3 Interface systems

GeoDesy-FSO E3 systems provides connection for large data speed, 34Mbps. perfectly fits for connecting BSCs. Multiplexers are also available for this product. Providing 16 times G703 balanced or unbalanced connection.



3.6 STM 1 systems

STM-1 systems provides connection over the link at the speed of 155Mbps with MM fibre SX interface with SC connectors (SM LX optional). The maximum installation distance between the head and the network equipment is 1000 meters in the case of MM fibre, and 5000 meters in the case of SM fibre.



4 Product matrixes

4.1 Interface matrix

In the spreadsheet below you can see the interface availability.

	E1	E2	E3	E100TP	E100	ATM155	Gig
1500	☑	☑	☑	☑	☑	☑	☒
2500	☑	☑	☑	☑	☑	☑	☒
5000	☑	☑	☑	☑	☑	☑	☒

4.2 Power supply configuration

	230VAC	110VAC	230VAC/110VAC+ Glass heater	48VDC	48VDC+ glass heater
1500	☑	☑	☑	☑	☑
2500	☑	☑	☑	☑	☑
5000	☑	☑	☑	☑	☑

5 Content of the package

GeoDesy-FSO provides three product range with three different kinds of package contents. The **GeoDesy-FSO GD** (comprising 1500, 2500 and 5000 links) contains only the heads, the ABUs (alignment base unit) and the ODIUs (outdoor interconnection unit). The brackets are not provided with **GeoDesy-FSO GD** product range neither the necessary screws bolts and wall plugs.

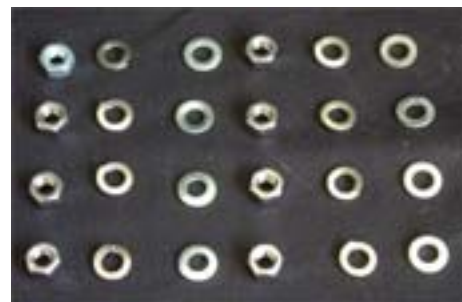


GeoDesy-FSO does not provide power cable for the connection of the main and the outdoor box.

For the detailed information please see the chapters below:

5.1 Contents of a GeoDesy-FSO PRONTO link

- 2ps of **PRONTO** heads
- 2ps of **GD ODIUs** (Outdoor Interconnection Unit) /the two grey plastic boxes/
- ODIU accessories:
 - 2ps of 276x110x1,5 metal plates
 - 2x4ps of 6x40 spacers
 - 2x4ps of 6x15 spacers
 - 2x4ps of M6x70 flat sphere headed screws
 - 2x4ps of M5 nuts
 - 2x4ps of spring washers
 - 2x4ps of washers
 - 2x4ps of ø8x48 wall plugs
 - 2x4ps of M4,5x70 cross headed self-tapping-screws
- a manual CD
- 2ps of Alignment Base Units(ABU) /a heavy, podgy, hub cap form metal appliances/
- 2x2ps of spacers

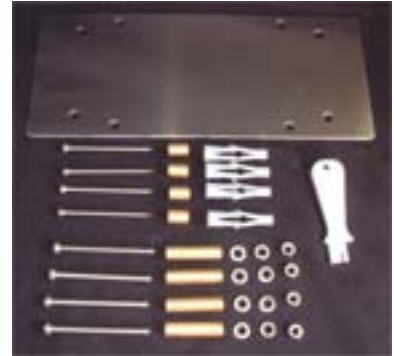


- ABU accessories /plastic packages attached to the ABU/:
 - 2x4ps of M8 nuts
 - 2x4ps of 8mm spring washers
 - 2x4ps of 8mm washer
- accessories for the head fixing /on the legs of the heads/
 - 2x4ps of M8 nuts

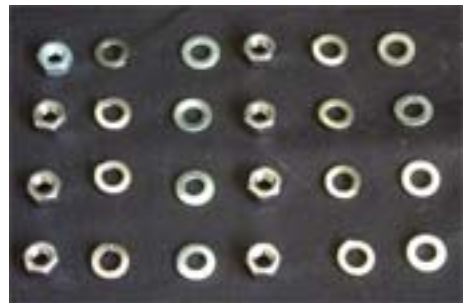
- 2x4ps of 8mm spring washers
- 2x4ps of 8mm washers

5.2 Contents of a GeoDesy-FSO GD-2500 link

- 2ps of **GD-2500** heads
- 2ps of **GD ODIUs** (Outdoor Interconnection Unit) /the two grey plastic boxes/
- ODIU accessories:
 - 2ps of 276x110x1,5 metal plates
 - 2x4ps of 6x40 spacers
 - 2x4ps of 6x15 spacers
 - 2x4ps of M6x70 flat sphere headed screws
 - 2x4ps of M5 nuts
 - 2x4ps of spring washers
 - 2x4ps of washers
 - 2x4ps of ø8x48 wall plugs
 - 2x4ps of M4,5x70 cross headed self-tapping-screws
- a manual CD
- 2ps of Alignment Base Units /a heavy, podgy, hub cap form metal appliances/
- 2x2ps of spacers



- ABU accessories /in a plastic bag attached to the ABU/:
 - 2x4ps of M8 nuts
 - 2x4ps of 8mm spring washers
 - 2x4ps of 8mm washers
- accessories for the head fixing /on the legs of the heads/
 - 2x4ps of M8 nuts
 - 2x4ps of 8mm spring washers
 - 2x4ps of 8mm washers

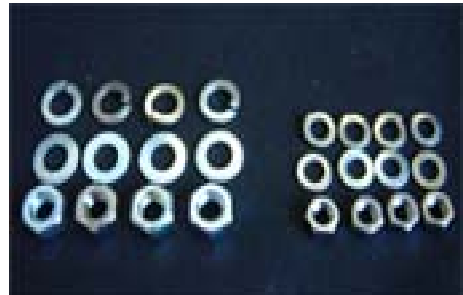


5.3 Contents of a GeoDesy-FSO GD-5000 link

- 2ps of **GD-5000** heads
- 2ps of **GD ODIU**s (Outdoor Interconnection Unit) /the two grey plastic boxes/
- ODIU accessories:
 - 2ps of 31,5x14x1,5 metal plate
 - 2x4ps of 6x40 spacers
 - 2x4ps of 6x15 spacers
 - 2x4ps of M6x70 flat sphere headed screws
 - 2x4ps of M5 nuts
 - 2x4ps of spring washers
 - 2x4ps of washers
 - 2x4ps of ø8x48 wallplugs
 - 2x4ps of M4,5x70 cross headed self-tapping-screws
- a manual CD
- 2ps of Alignment Base Units /a heavy, podgy, hub cap form metal appliances/
- 2x2ps of spacers



- ABU accessories /a plastic bag attached to the ABU/:
 - 2x4ps of M8 nuts
 - 2x4ps of 8mm spring washers
 - 2x4ps of 8mm washers
- accessories for the head fixing /on the legs of the heads/
 - 2x4ps of M12 nuts
 - 2x4ps of 12mm spring washers
 - 2x4ps of 12mm washers



6 Sites of installation

6.1 Key factors of operation

There are four key issues that the site survey has to shed light on. Proper system operation cannot be guaranteed without satisfying all of the four requirements.

Clear line of sight - The entire optical path between the two ends must be free of any obstacles. It not only means that one has to see the other side, but other possible sources of disturbance should also be taken into consideration. For example there might be turbulence above the roofs and other constructions, and this can cause fraction or scattering of the beam or snow accumulation on roofs too close to the beam can influence or even interrupt communication.

Solid mount surface - is the key for long-term operation. Since the diameter of the beam is limited, it is extremely important to mount the unit on a stable structure with the possible smallest movement. This way the receiver of the remote unit cannot get out of the beam due to the movement of the opposite head.

East-West orientation - although the receiver optics are equipped with optical filters to protect the receiver diode from the effect of undesired light sources, direct sunshine can cause saturation of the diode. This prevents the system from working properly for several minutes a day at certain times of the year. In most cases this effect can be avoided by careful selection of the mounting spot.

In order to comply with the requirements of the successful installation - including the discussed four key factors and other criteria - the following matters should be taken into consideration.

6.2 Preferred installation sites

All buildings and constructions have a certain movement of their own. It's determined by the structure and material of the building. Metal structures can shift or twist due to temperature changes. Wooden construction can expand or shrink with any changes in humidity. Give preference to concrete or brick buildings. On the other hand high structures like towers, skyscrapers or poles are always subject to movement. Mount the support frame to walls of the building or near corners, as they are the most stable spots. Use appropriate consoles for wall mounting. If a stand is used on the top of

building, secure it directly to the ceiling or to the concrete cornice wherever is possible. Do not fix stands to insulating materials as they can slowly sink under the weight of the unit and with temperature changes. Big chimneys and smokestacks may look stable, but as their inner temperature varies they can also move. Vibration caused by heavy traffic, trains and elevators etc. may slowly move the system out of its specified direction. Another important consideration is to provide enough space for alignment and to have the potential for future maintenance. Consider that the support frame is usually heavy, so the selected spot should be easily accessible.

<i>Preferred installation sites</i>	<i>Pay attention to</i>	<i>Avoid (*)</i>
Concrete wall	Behind window	Soft materials
Brick wall	Old constructs	Chimneys
	Microwave towers	Wooden constructs
		Metal masts or Frames
		Hidden heat isolations, like Styrofoam

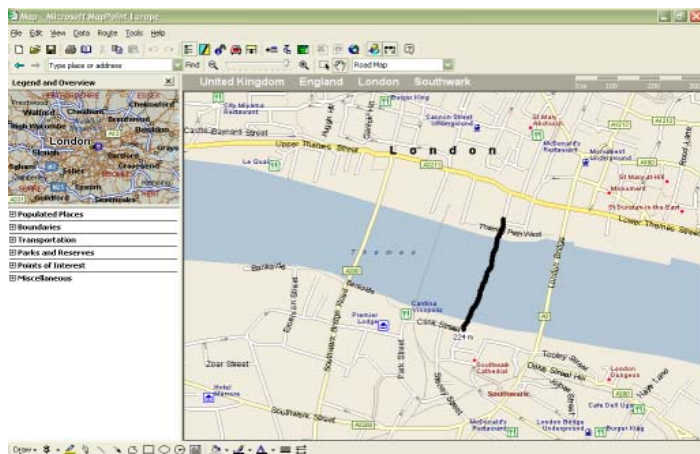
(*)

In cases where installations are listed under "AVOID" cannot be avoided than special mounting accessories to be designed and special installations must be used.

It is not only the building that has to be solid, but the support structure too. Antenna poles and security camera holders are not suitable for the **GeoDesy-FSO** units.

6.3 Distance measurement

Because the units were designed, and calibrated for certain distance operations the higher distance will decrease the availability. GeoDesy-FSO pre-calibrates and pre-tests every unit shipped to the customer. To ensure that the unit you are about to



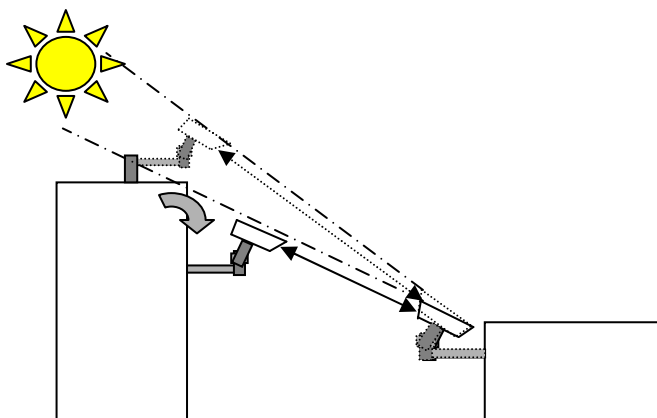
buy fits to the needs, the first step is to measure the distance. The best way to measure it is by GPS (Global Positioning System), these units are accurate enough to determine the distance between two points. For more details please refer to the GPS manufacturer handbook. Also there are several other ways to measure the



distance. If you know the exact address you can use mapping software like MapPoint or Auto route.

6.4 Direct sunshine

To prevent the sun shining directly into the receiver optics, first one has to determine the orientation of the link. Try to avoid East-West orientation wherever it is possible. Examine both sides of the link at sunset and sunrise and find a position where the sun cannot get behind any of the heads. Be aware that the path of the sun is changing throughout the year.



7 Eye safety

There are no two installation spots of the same kind, the buildings or structures, the available space and the accessibility of the place will be different in each case. Nevertheless, as a general rule it is very important to select the installation site so that nobody can look directly into the transmitter. For this reason place the head either so high (on the side wall of the building) or so close to the edge of the building (on a parapet on the rooftop) that no person can approach it accidentally and can get into the beam path. Set up barriers if necessary and put warning signs at prominent places.

The laser heads are provided with all labels and hazard warnings required by the laser standard. There are warning labels on both the left and right side of the

protective cover next to the optical window and there is a warning and an informative label on the rear side of the laser head.

8



GeoDesy FSO a member of HORVÁTH HOLDING		CE
NAME	: Outdoor Interconnection Unit	☐
Type	: GD-ODU-230	
S/N	: GD-6300984	
Primary side	: 230VAC 50Hz 0.2A	
Secondary side	: ±12VDC ±1,25A	
Protection	: IP65	
Safety class	: Class II.	
	EN 60950-1:2001 (electrical safety),	
	EN 55022:1998+Corr:2001+A1:2000 and EN 55024:1998	
Dismounting the cover can cause fatal injury!		
Manufactured by GeoDesy Ltd www.geodesy.hu		

GeoDesy FSO a member of HORVÁTH HOLDING		CE
Type	: GD-P0200E1000F	
S/N	: GDH-«Ssz_1»	
Input Power	: ±8,5VDC ±1,25A ; +29VDC +40mA	
Laser	: 70mW, Class 3B	
Wavelength	: 785nm	
	EN 60825-1:1994+A11:96+A2:2001 (laser safety),	
	EN 60950-1:2001 (electrical safety),	
	EN 55022:1998+Corr:2001+A1:2000 (emission)	
	EN 55024:1998	
Manufactured by: GeoDesy Ltd0 www.GeoDesy-FSO.com		

The mounting bracket

For the **GD Series** systems the brackets are optional, but they should be fixed with long term reliable bolts and screws. **GeoDesy-FSO** has successfully tried and used "Hilti Anchors" product range. Product codes: HVU; MD; HAS fixing systems. For more details of usage please contact your local Hilti distributor.

In the following chapter you will find detailed description of the bracket fastenings.

8.1 Fixing High-End product range brackets

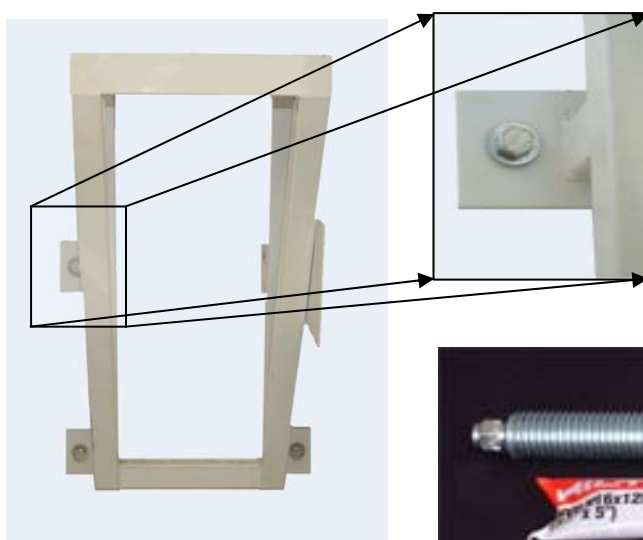
The fastening of the **GD Series** is very critical point of the installation. Due to the distance, that can be up to 5 km. We will introduce you the necessary fixing method however this method can be different depending on the holder frame type and the surface. Please note that different fixing method must be used with concrete surfaces and with brick. For the best fits, fastening methods please contact to your local dealers, or refer to their website. If you have questions about the fixing, contact GeoDesy-FSO.

There are no two installation sites from the same kind. Sometimes individual design is required, GeoDesy-FSO provides wide range of Brackets can be found on this CD, feel free to modify or manufacture them, however the sale of the bracket drawings is strictly restricted. To help you to design your own brackets GeoDesy-FSO recommends the following,

Material: DIN1.0034

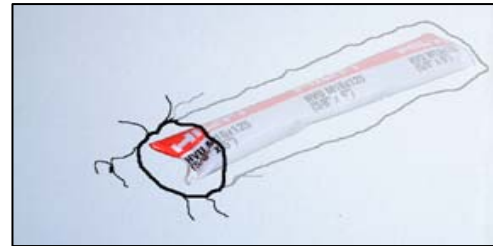
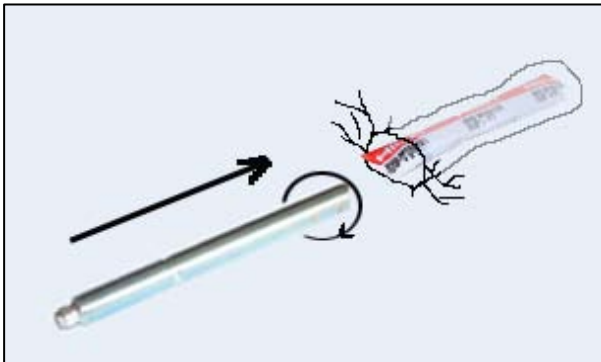
Colour: white or light silver with reflective painting. (To reduce the movements caused by the heat expansion)

The material must be treated for long term use, sometimes in extreme rain, snow, sun, humidity or sand environments to shield against corrosion.



For the sample we have used a very simple example. The surface is concrete and the fixing material was Hilti HVU and the screw was Hilti HAS system. The steps are as follows:

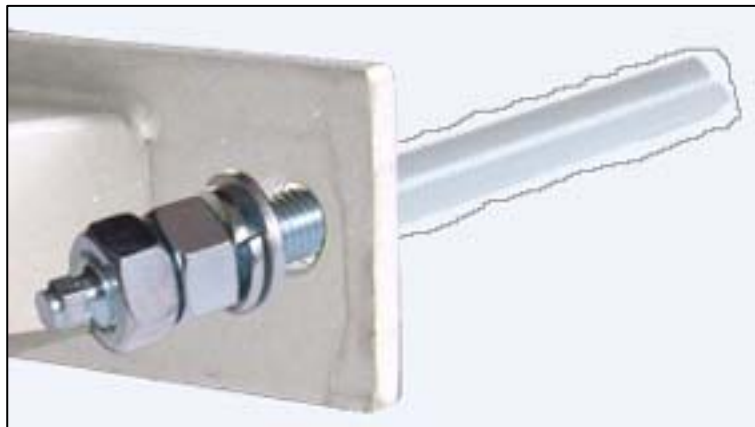
- Push the holder frame against the wall on the desired place
- Mark the place on the wall with permanent marker or pencil
- Drill the holes
- Clean the holes
- Place the small bag into the cleaned hole
- With a drill drive the screw into the hole through the plastic bag



- Refer to the packaging about the timing while the glue sets solid enough to enable you to strain the screw
- After it sets dry place the

mounting on to the screws

- After it sets dry for fastening fasten the bolts (the fastening power should be min of 120Nm with a M16 sized bolt)



Note: Spacers and spring spacers should be used every time you fix a bracket as the figure shows above.

9 System installation

9.1 On the table test

Warning! Do not look either into the transmitter or the receiver optics because at this distance even the reflected laser beam *can* be dangerous to your eyes. Operating the system on much shorter distance than presumed originally can cause saturation or even permanent damage to the receiver. Always use optical attenuators for this kind of test.

The on-the-table test needs careful planning and careful use during the test period. The units should be placed at about 2 m distance from each other with optical windows facing one another. Put an appropriate optical attenuator (Attenuating foil or cardboard with several small holes) between the heads. Make all the necessary connection as described below to connect your network equipment (computer or protocol analyzer) to the heads and power up the units. Turn ON the Outdoor Interconnection Units and check if the power LED is ON on the head.

You should be able to align the units without any tool and get full received level on the signal strength LED's. Make sure that the "Saturation" indicator is OFF. Adjust your attenuators if necessary to avoid saturation of the receivers.

Please note that at this short distance, specially the longer distance links can reflect to the remote site or even to the same head. If you experience full receiving level, with no traffic throughput, in that case try to move the heads slightly units out of the reflection zone.



Please also take in consideration that the laser beam is concentrated and in such a short distance can harm your eyes, every time you test the units on short distance, do it with extra care. Never look into the sighting device if the remote laser is turned on. We strongly suggest to double check the power connection before you turn on the device. Handle the power connection with extra care. Safety first.

After obtaining the desired received level, check the data connection between devices. Using computers or appropriate testing devices.

On the table tests are perfect for troubleshooting (If there is a transmission problem, check the status of the connecting devices (e.g. Link signal or cable polarity) and

cables.) in a controlled area. If you experience some problems during the test, please try to test the connected equipments with a direct connection.

9.2 PRONTO systems

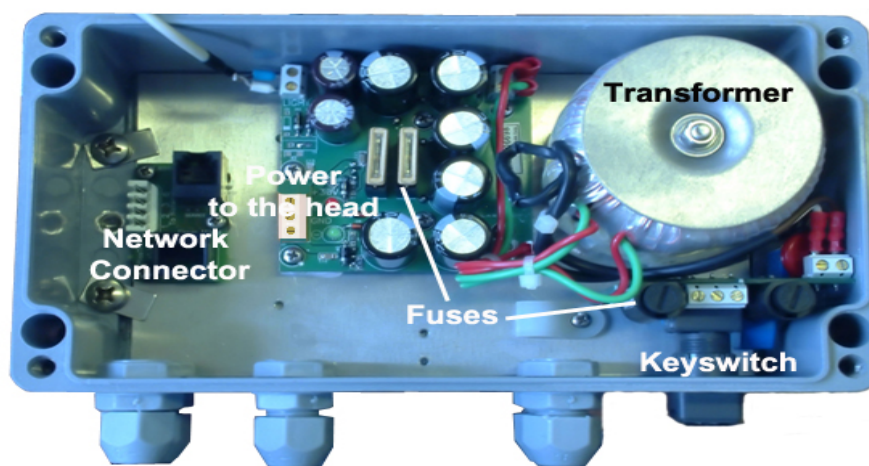
9.2.1 What is PRONTO about?

The **PRONTO** series products from **GeoDesy-FSO** are laser based free space optical systems designed to provide flexible, reliable and secure solution for high speed wireless connections up to 1500 m. Due to their modular design the equipments are easy and fast to troubleshoot and upgrade on the field. Adjustable transmitter optical system allows custom configuration of the system for specific installations. The patented Aperture Control Mechanism delivers outstanding system availability figures. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments. Furthermore, **PRONTO** series systems can be ordered with IP based SNMP compatible device management that allows remote control and monitoring of the equipment. Because they use infrared light as transmission medium, **GeoDesy-FSO** systems do not require frequency licenses and the transmission is not affected by electro-magnetic interference. The concentrated laser beam is extremely hard to tap, even to discover since it cannot be detected by spectrum analyzers. Basically, a **GeoDesy-FSO** link can be considered as a virtual fibre in the air. For the detailed alignment and power connection description please see the chapters below.

9.2.2 How can you install the ODIU?

Functionalities of the ODIU

The outdoor interconnection unit (ODIU) provides the power supply and data connection for the head. The power connection (+12VDC, GND, -12VDC).



The ODIU made from poly-propylene enforced with fibre. This construction provides robust shock and waterproof environment (IP65) for the electrical devices.

The transformer is a not switch able transformer, so the main voltage must match to the one marked on the front cover. If the main power is different then this can damage the transformer.

In the ODIU there can be found four fuses, two for the transformer and the other two for the head.

Fuses

On the primarily side, the fuse ratings are: T0.8 (250V)

- in the case of glassheater the fuses are T1,6A (250V)

On the secondary side, the fuse ratings are: T7,5A (250V)

- in the case of glassheater the fuses are T10A (250V)

On the glassheater-panel the fuses are T6,3A (250V)

Installing the ODIU box

The physical fixing of the ODIU box can be seen below.

Necessary toolkit:

- Philips screwdriver
- 5mm wrench
- Drilling machine with an Ø8mm bit (the minimum effective length is 50mm)

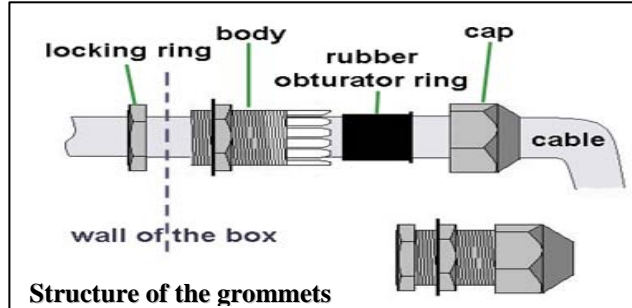
First you have to fix the ODIU box to the metal plate:

- Pick the four M6x70 flat sphere headed screws, and take them to the holes on the corners of the box
- On the back of the box, where the screws came out, you have to put up the four 6x40 spacers (these are the longer ones) to the legs of the screws
- Pull on the metal plate to the legs of the screws
- Fix the metal plate with four M5 nuts using the four washers, and four spring washers like in the figure



Then you can fix the whole construction to a wall:

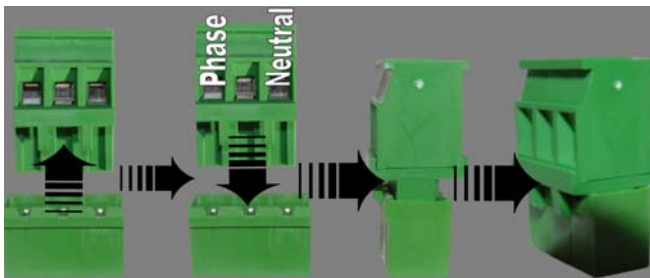
- Drill four holes, using the metal plate for measuring the places of the bores, with a Ø8mm bit. The depth of the bores have to be a minimum of 50mm
- Put the four wall-plugs into the four holes
- Put the four M4,5x70 cross headed self-tapping-screws through the four free holes of the metal plate
- Pull up the four 6x15 spacers (the shorter ones) to the screws
- Tight the screws into the wall-plugs, and tight it up as strong as possible for the appropriate fastening



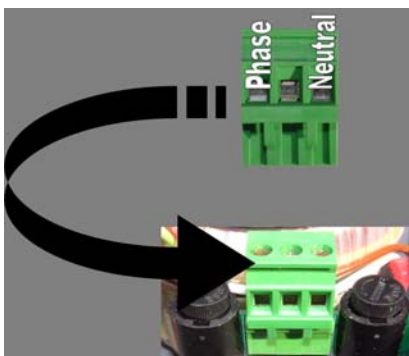
Connecting the head to the ODIU, and the ODIU to the power supply

To make the connection for the 230VAC

1. remove the connector from the slot
2. connect the cables /using the cable shoe/
3. reconnect the connector to the slot
4. secure the connector in the slot /make sure it is seated securely, connectors clips are latched/



For the power connection recommended to use two-wired Ø0,75mm cables.

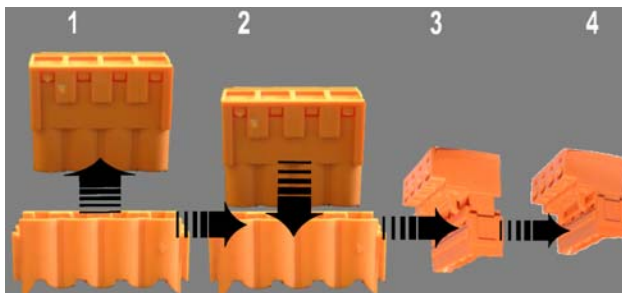


For the power connection recommended to use three-wired Ø0,75mm cables. The order of the connection can be seen on the figure.

- P – Phase
- N – Neutral

The necessary power can be supported to the head by the connector which can be seen in the figure next to this text. Order of the cables from the head: (the four-twisted-pair-wired cable)

- Not connected
- Red - +12V
- Twisted green-yellow - GND
- Black - -12V



1. Remove the connector from the slot
2. Connect the cables /using the cable shoe/
3. Reconnect the connector to the slot
4. Secure the connector in the slot /make sure it is seated securely, connectors clips are latched/

9.2.3 Fixing the heads



Your **PRONTO** head can be fixed to its stand with an Alignment Base Unit (ABU). On the figure you can see an ABU, and a plinth of a **PRONTO** unit, and the necessary fixing parts. The necessary nuts and washers can be found on the legs of the head. The steps of the fixing are:

- Tight up all the nuts.
- First, fix the ABU to the stand using the washers and nuts
- Place the head to the ABU
- Fix the bolts with the nuts, using the washers

9.2.4 Alignment of the heads

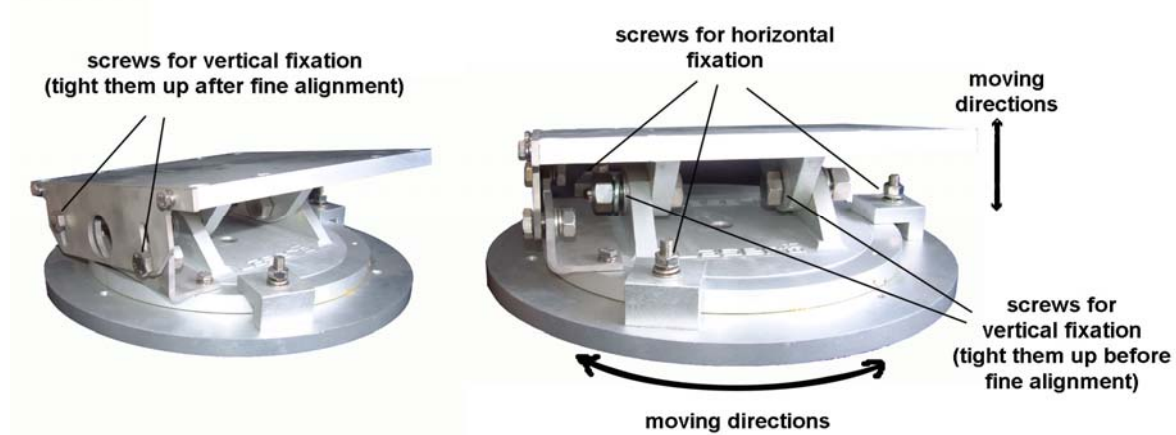
Steps of the head fixation



- Target Side B with the crosshair built in to the head on Side A!
- Screw the two nuts up tight on both heads, which are used for the fixing the vertical direction, but be careful that the heads do not move out from its position!
- Screw the three nuts up tight on both heads, which are used for the horizontal fixation, but be

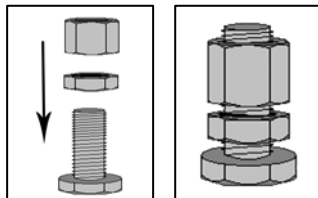
careful that the heads do not move out from its position!

- Repeat this on the other side of the link!

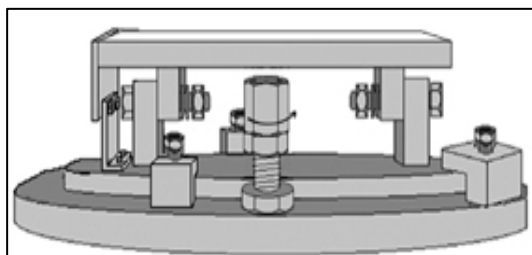


- Place up the spacers on both sides!

Place the two spacers where the figure shows to.



Open the spacers until it reaches the bottom of the upper plate of the ABU! Repeat this on the back side too!

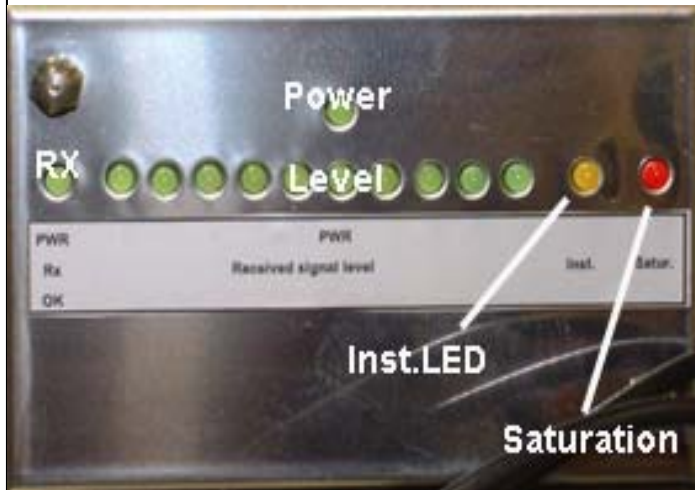


Then do the same on the remote side too!

Meanings of the LEDs

Power:

The head is powered up.



-RX :

Only for manufacturing, and calibration purposes. Not effecting link functionality

Level LEDs:

The function of these 10 green LEDs is to give visual information about the incoming light efficiency

Installation LED:

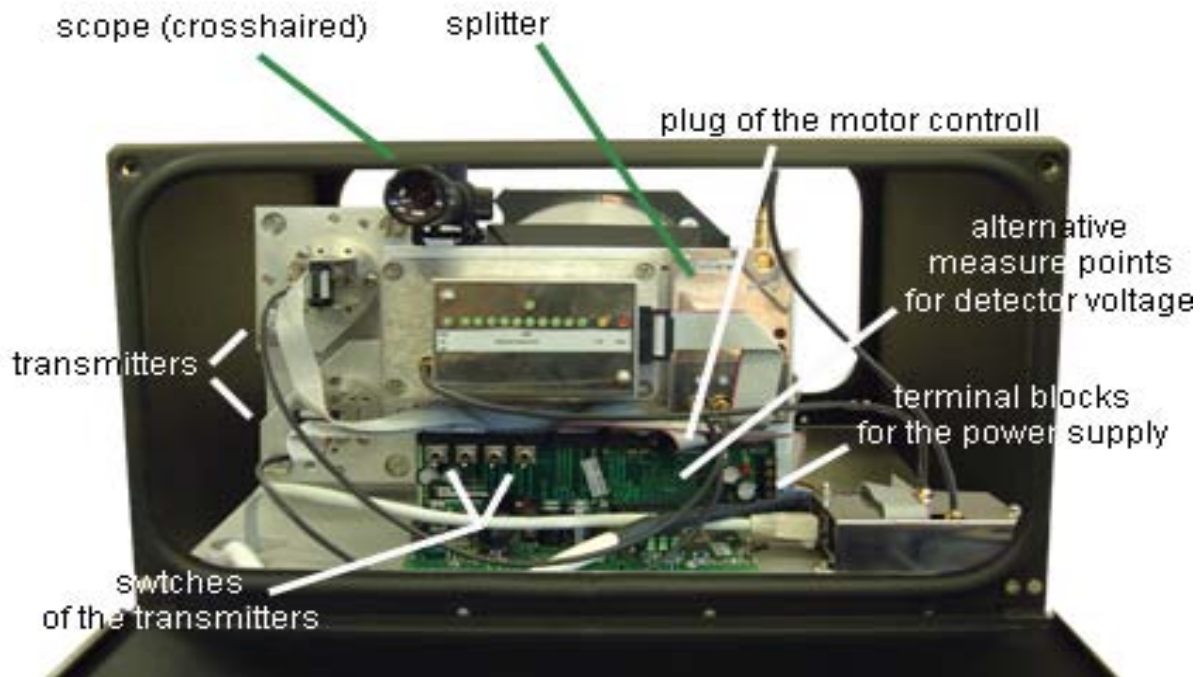
It signs you have the biggest amount of incoming light efficiency which is still not overloads the receiver

Saturation:

Overload (Overloading can cause stop in the communication, and permanently it can damage the receiver)

After 15mW (or higher) incoming light efficiency

- Open up the heads



- Power up the heads!

Receiver Alignment

- After a few seconds unplug the plugs of the motor controllers on both sides!

The motor control is a “light-buffer” this saves the power for the bad weather and in the same time protects the receiver against overload. During the alignment it can be used manually, to avoid the saturation, and keep the detector voltage on the level where it can be still monitored. The detector voltage can be increased to seven volts; above seven volts you won’t be able to monitor the detector voltage. This plate is located in front of the receiver, and you can rotate it (clockwise decreases the detector voltage, counter-clockwise increases).

- Follow the steps below
 - 1 Switch on one of your transmitter on one side, and switch off all the others. Switch off the transmitters on the other side too.

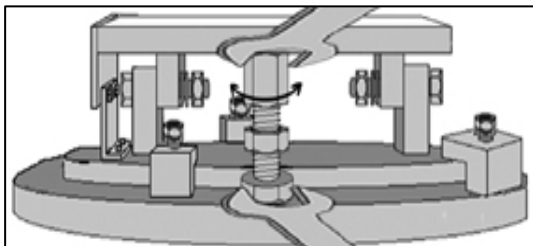
Orders of the switches:

You can check which transmitter is in use, after you switched on one of the switchers, with the green LED on the back of every transmitter. Each LEDs are indicates if them transmitters are functioning, and transmitting.

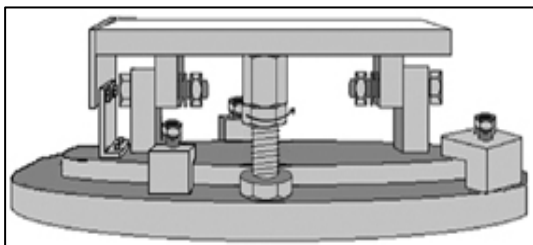
- 2 Move the head with the off switched transmitters until you can get the biggest incoming light efficiency on the other side.
- 3 Fix the head as hardly as you can!
- 4 Repeat this with the other head too.

The receiver alignment should be done on both sides; the requirement is some incoming light from the remote side (at least receive). This alignment will determine the position of the head and in the head the position of the receiver. The idea is similar to the focusing, but the only way to find the focus is to move the head.

You can check the incoming light efficiency in two ways. Once you can use the LEDs of the receiver. Second is to measure the detector voltage using the two pins on the motherboard (if you have not got management in your head, then the detector voltage is been measurable on the blue and the brown wires of the heads own power cable too).



Because of the weight of the heads for the vertical moving you can use the spacers as it is shown on the figure. For this moving you need two wrenches. With one of them you have to hold the head of the bolt, and with the other you can turn the thick nuts to lift or loose the plate of the ABU.

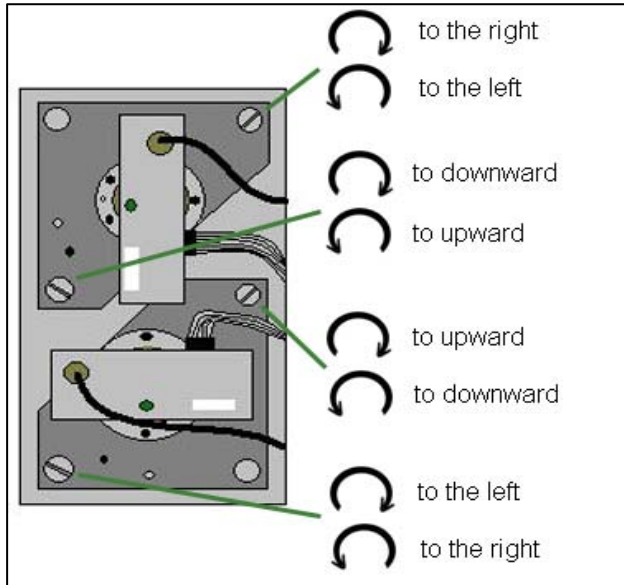


To not enable any movement after the receiver alignment on the vertical angle of the head and due to the heat expansion please close the locking nut under the thick nut, as it shown on the figure, on both sides.

Please note before the vertical receiver alignment we strongly suggest doing the horizontal the same way as it is written above

Beam Alignment

- Switch off all of the transmitters on both sides.
- Switch on one of your transmitters on one side.
- Move the beam to the middle of the remote head.

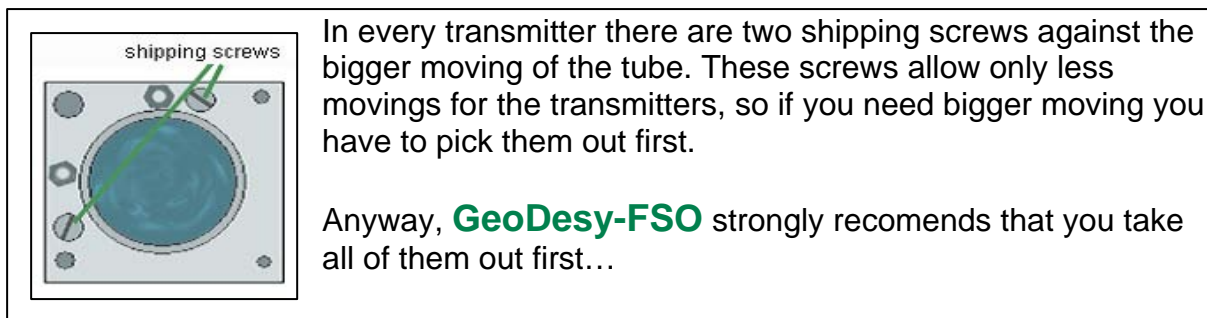


You can move the beam with the screws on the back of the transmitters. The directions of beam moving in the function of the turning direction of the screws can be seen on the figure.

You can check the position of the beam using a digital camera with infrared lenses. You can see the beam shining on the landmarks around the remote head from the side of the transmitter, or until dusk you can see the line of the beam with your own eyes.

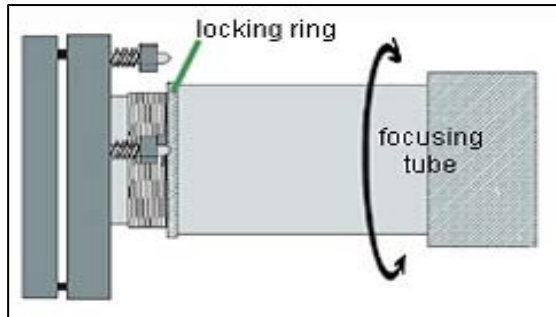
From the remote side you can see the light of the beam behind the head with the shadow of the head on a surface (for example on a wall), or if you see toward the side of the transmitter, there you can see shining the beam on landmarks, and with the growing and declining of the shining rounded plate, which is the beam, you can follow its moving.

- Repeat the beam alignment with each transmitters on both sides



Set the beam size

You can set the beam sizes of each transmitter separately. So do not switch on more than one transmitter in the same time!



You can set the beam size turning the focusing tube. First you have to loose the shipping screws which are functioning as transmitter fasteners, during shipment. Then you have to loose the locking ring which fastens the focusing tube. After that you can manipulate with the beam size turning the tube. If you turn it in clockwise direction the diameter of the beam will increase, and in counter-clockwise

direction the beam size will decrease.

After you set the beam size, do not forget to lock the locking ring and tight up the two shipping screws, but be careful that the transmitter does not move out its position!

To provide the excellent operation you need the following beam sizes:

- On 500m distance the diameter of the beam should be 0,75 meters!
- On 750m distance the diameter of the beam should be 0,85 meters!
- On 1000m distance the diameter of the beam should be 1 meter!
- On 1250m distance the diameter of the beam should be 1,2 meters!
- On 1500m distance the diameter of the beam should be 1,5 meters!

You can measure your beam size using a digital camera with infrared lenses. With this you can see the beam behind the head on a surface (for example on a wall) and there you can measure it. In that case if there are not any surfaces for beam measuring, you can do it in the following method:

Face the remote side and check the beam with your camera. Move slowly to the right in straight line until the picture of the beam, what you see in the camera, is reducing, and sign that place. Do the same on the left side. Then you can measure the distance between the two signed places. That will be the diameter of the beam. If you can not use the camera efficiently enough, you can do it with your own eyes too. The method is the same with one difference, the border of the beam is where You cannot see the red dot on the transmitter lens of the remote side.

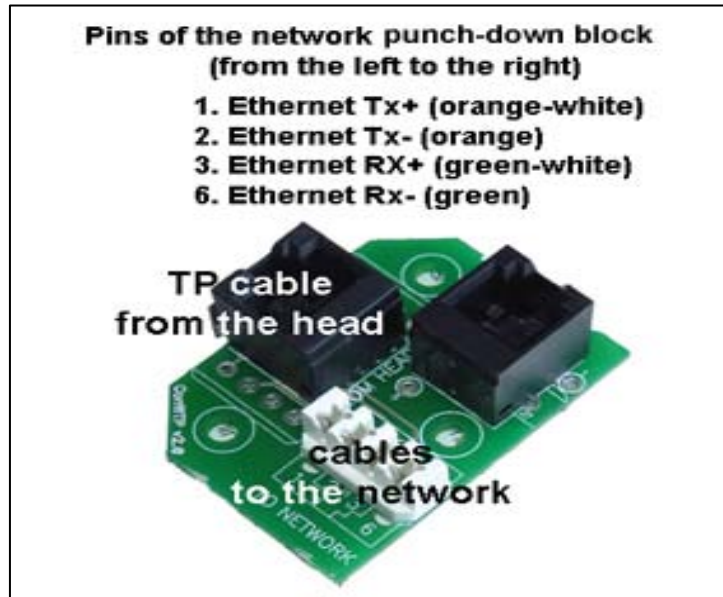
Repeat the setting on both sides with all of the transmitters!

End of the alignment

- Switch on all of the transmitters!
- Plug the motor controller cable back to the slot!
- Close up the covers of the heads!

9.2.5 Connecting to your Network

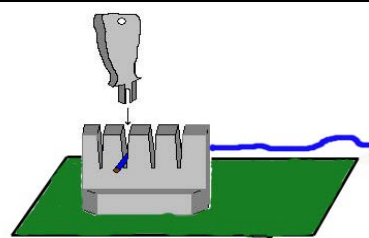
If you have a TP head



You can find a TP connector unit in your ODIU, with there connectors. You have to plug in the TP cable of your head into the RJ45 connector. Your network is connectable to the GD system using the white one rowed connector, where you have to connect the four cable of your network with the help of the punch down tool. The order of the cable can be seen on the figure.

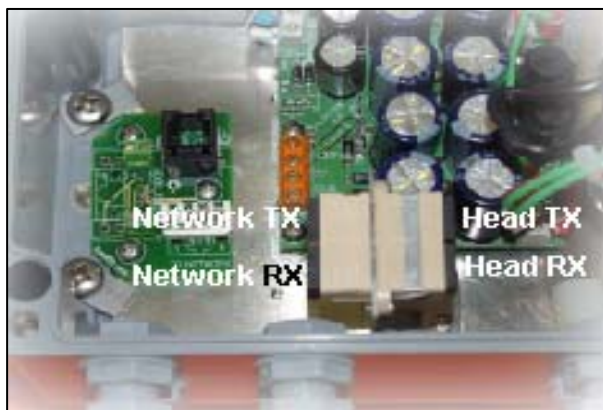
The punch-down tool

Place your first cable on the top of the chosen connector, without removing the insulator from the cable. Then using the punch down tool push down the cable into the connector.



If you have a TC head

You can find a two sided fibre connector in your ODIU. You have to connect the fibre



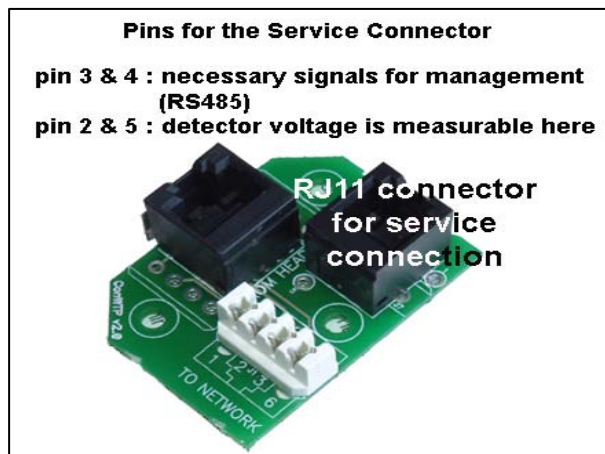
cable of your head into the one side of the connector, and into the other side you have connect the fibre cable of you network equipment (switch; router or GD combiner). The fibre plugs of the heads are always SC typed, which means that them cross-sections are cubic form. The fibre connector in the ODIU is SC-SC typed, so you have to provide an SC fibre plug for you network. The SC-SC connector is a reversible part, so you can connect in

the first plug where you want, the important is that the two plugs of the head have to be on one side, and the two plugs of the network have to be on the other, and if you plug in the transmitter side of the head into a connector, then the transmitter side of

the network have to be in the opposite connector of the previous, and do the same with the other sides too.

9.2.6 Connecting to the management

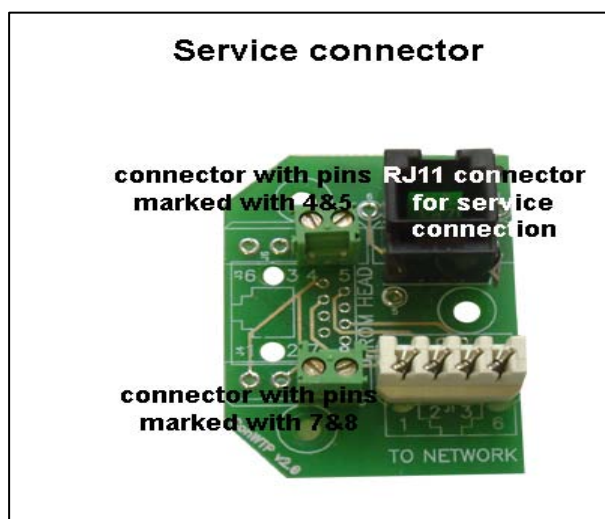
If you have a TP head



Using the RJ11 Service Connector you can connect your management indoor unit to the head, and you can measure the detector voltage of the receiver of the head as well.

More details about the management please find to see its own Users' Manual.

If you have a TC head

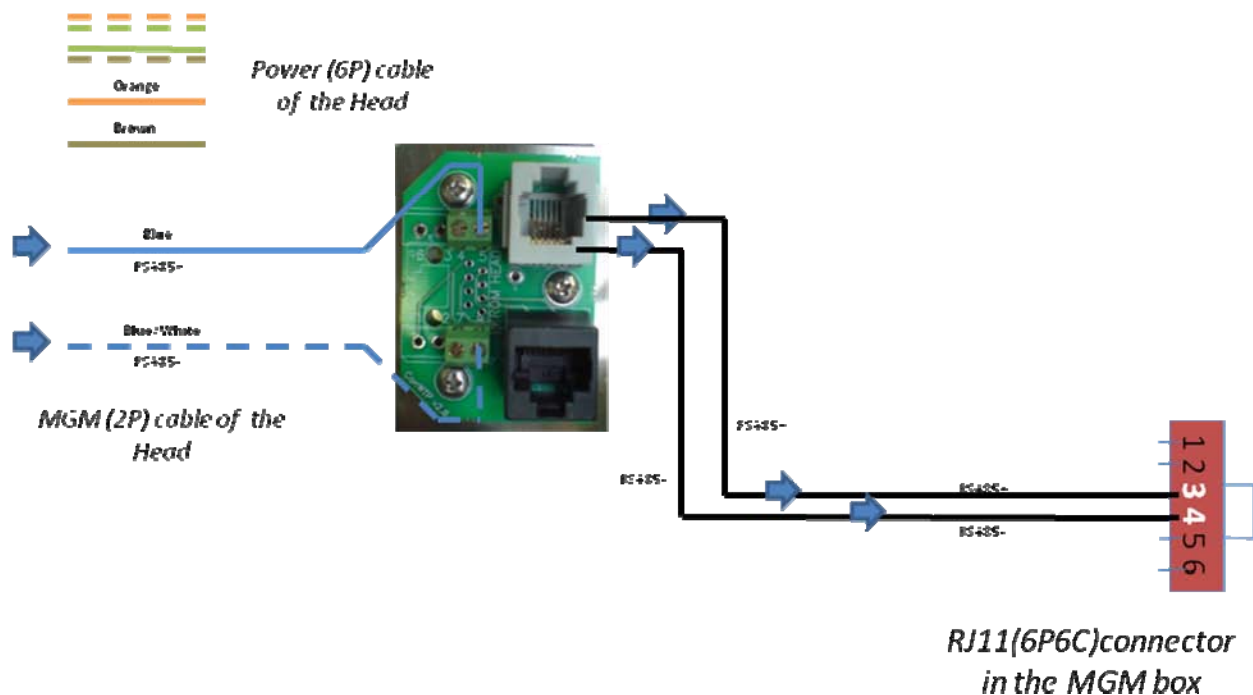


Using the RJ11 Service Connector and the two green connectors you can connect your management indoor unit to the head.

The necessary signals can be found on the blue and brown wires of the head power cable. You have to connect these two wires into two pins of the four of the two green connectors. These pins are connected to the pins of the RJ11 Service Connector. The order of connections is the following:

Pin of the green connector	4	5	7	8
Pin of the RJ11 Service Connector	4	5	3	2

More details about the management please find to see its own Users' Manual.
(please connect the blue and the brown wires to the Pin number 4&7 in case of The Web-Based GD-View MGM unit)



9.3 GD-2500 systems

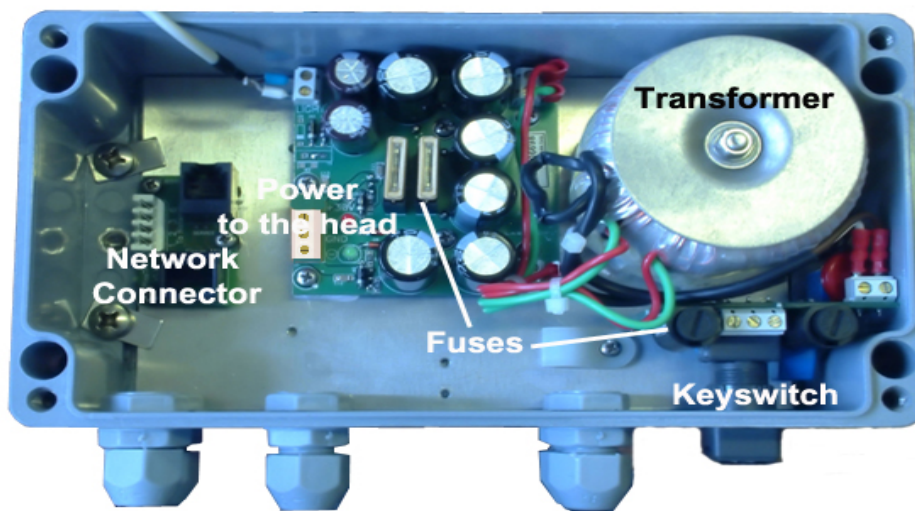
9.3.1 What is GD-2500 about?

The **GD-2500** series products from **GeoDesy-FSO** are laser based free space optical systems designed to provide flexible, reliable and secure solution for high speed wireless connections up to 2500 m. Due to their modular design the equipments are easy and fast to troubleshoot and upgrade on the field. Adjustable transmitter optical system allows custom configuration of the system for specific installations. The patented Aperture Control Mechanism delivers outstanding system availability figures. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments. Furthermore, **GD-2500** series systems can be ordered with IP based SNMP compatible device management that allows remote control and monitoring of the equipment. Because they use infrared light as transmission medium, **GeoDesy-FSO** systems do not require frequency licenses and the transmission is not affected by electro-magnetic interference. The concentrated laser beam is extremely hard to tap, even to discover since it cannot be detected by spectrum analyzers. Basically, a **GeoDesy-FSO** link can be considered as a virtual fibre in the air. For the detailed alignment and power connection description please see the chapters below.

9.3.2 How can you install the ODIU?

Functionalities of the ODIU

The outdoor interconnection unit (ODIU) provides the power supply and data connection for the head. The power connection (+12VDC, GND, -12VDC).



The ODIU made from poly-propylene enforced with fibre. This construction provides robust shock and waterproof environment (IP65) for the electrical devices.

The transformer is a not switch able transformer, so the main voltage must match to the one marked on the front cover. If the main power is different then this can damage the transformer.

In the ODIU there can be found four fuses, two for the transformer and the other two for the head.

Fuses

On the primarily side, the fuse ratings are: T0.8 (250V)

- in the case of glassheater the fuses are T1,6A (250V)

On the secondary side, the fuse ratings are: T7,5A (250V)

- in the case of glassheater the fuses are T10A (250V)

On the glassheater-panel the fuses are T6,3A (250V)

Installing the ODIU box

The physical fixing of the ODIU box can be seen below.

Necessary toolkit:

- Philips screwdriver
- 5mm wrench
- Drilling machine with an Ø8mm bit (the minimum effective length is 50mm)

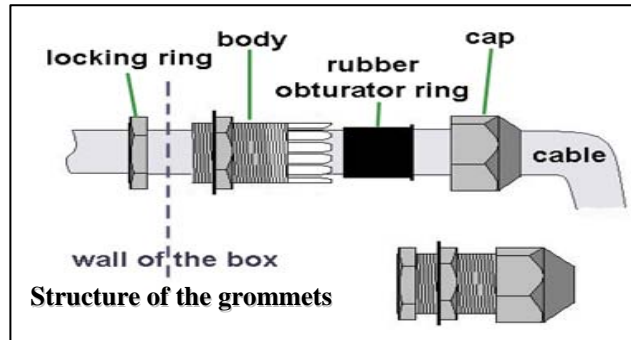
First you have to fix the ODIU box to the metal plate:

- Pick the four M6x70 flat sphere headed screws, and take them to the holes on the corners of the box
- On the back of the box, where the screws came out, you have to put up the four 6x40 spacers (these are the longer ones) to the legs of the screws
- Pull on the metal plate to the legs of the screws
- Fix the metal plate with four M5 nuts using the four washers, and four spring washers like in the figure



Then you can fix the whole construction to a wall:

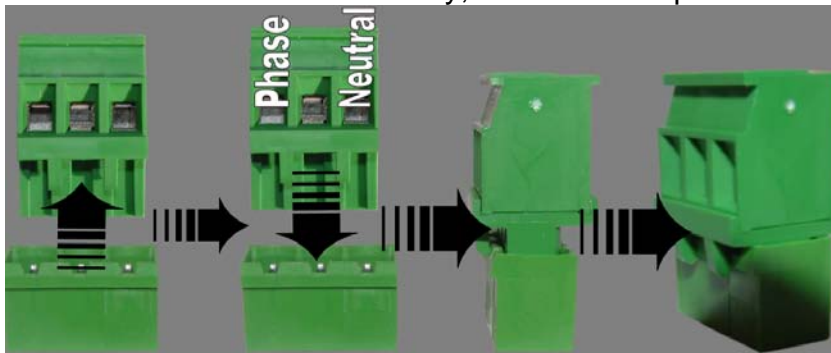
- Drill four holes, using the metal plate for measuring the places of the bores, with a Ø8mm bit. The depth of the bores have to be a minimum of 50mm
- Put the four wall-plugs into the four holes
- Put the four M4,5x70 cross headed self-tapping-screws through the four free holes of the metal plate
- Pull up the four 6x15 spacers (the shorter ones) to the screws
- Tight the screws into the wall-plugs, and tight it up as strong as possible for the appropriate fastening



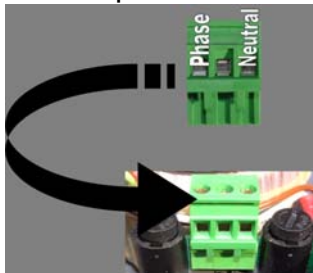
Connecting the head to the ODIU, and the ODIU to the power supply

To make the connection for the 230VAC

5. remove the connector from the slot
6. connect the cables /using the cable shoe/
7. reconnect the connector to the slot
8. secure the connector in the slot /make sure it is seated securely, connectors clips are latched/



For the power connection recommended to use two-wired Ø0,75mm cables.

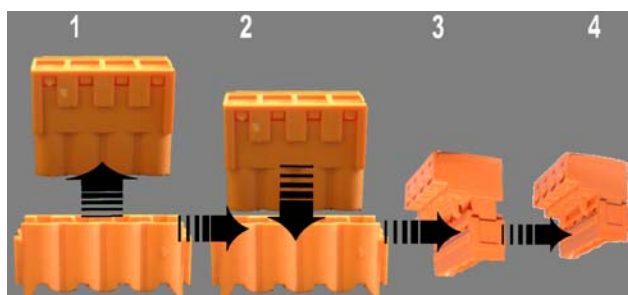


For the power connection recommended to use three-wired Ø0,75mm cables. The order of the connection can be seen on the figure.

- P – Phase
- N – Neutral

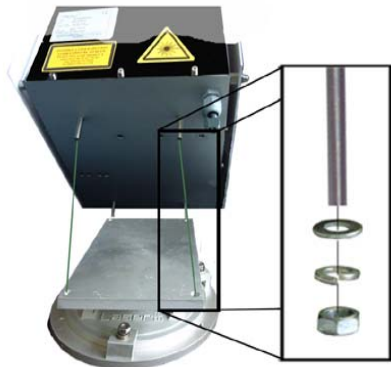
The necessary power can be supported to the head by the connector which can be seen in the figure next to this text. Order of the cables from the head: (the four-twisted-pair-wired cable)

- Not connected
- Red - +12V
- Twisted green-yellow - GND
- Black - -12V



1. Remove the connector from the slot
2. Connect the cables /using the cable shoe/
3. Reconnect the connector to the slot
4. Secure the connector in the slot /make sure it is seated securely, connectors clips are latched/

9.3.3 Fixing the heads



Your **GD-2500** head can be fixed to its stand with an Alignment Base Unit (ABU). On the figure you can see an ABU, and a plinth of a **GD-2500** unit, and the necessary fixing parts. The necessary nuts and washers can be found on the legs of the head. The steps of the fixing are:

- First, fix the ABU to the stand using the washers and nuts
- Place the head to the ABU
- Fix the bolts with the nuts, using the washers
- Tight up all the nuts

9.3.4 Alignment of the heads

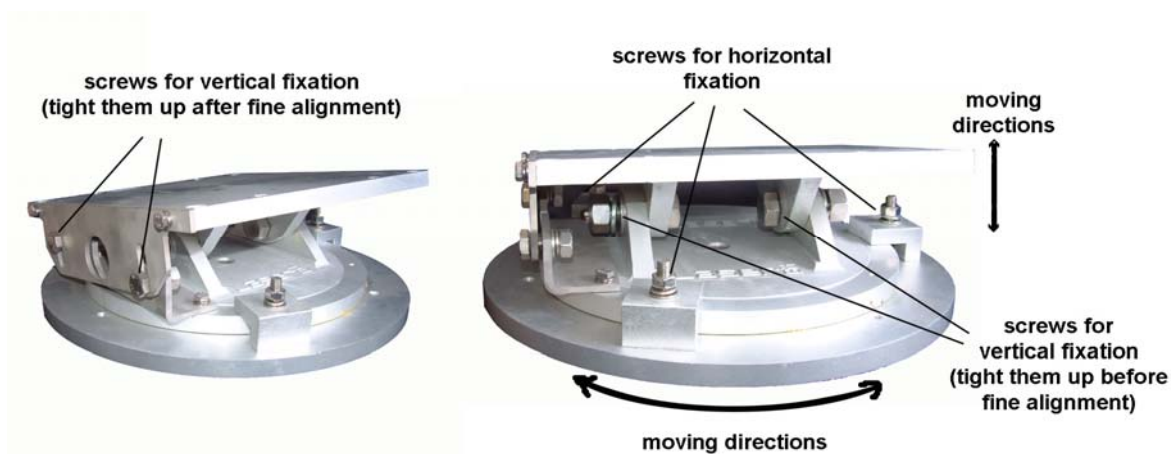
Steps of the head fixation



- Target Side B with the crosshair built in to the head on Side A!
- Screw the two nuts up tight on both heads, which are used for the fixing the vertical direction, but be careful that the heads do not move out from its position!
- Screw the three nuts up tight on both heads, which are used for the horizontal fixation, but be careful that the heads do not move out from its position!

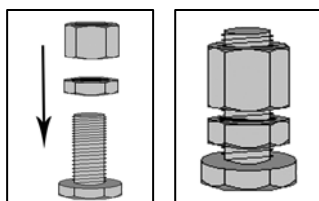
careful that the heads do not move out from its position!

- Repeat this on the other side of the link!

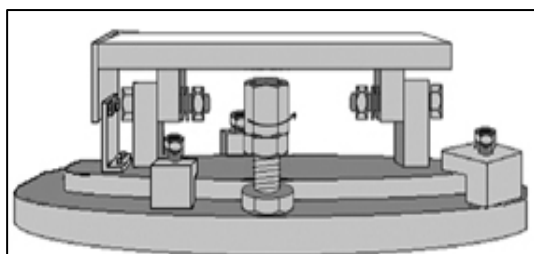


- Place up the spacers on both sides!

Place the two spacers where the figure shows to.



Open the spacers until it reaches the bottom of the upper plate of the ABU! Repeat this on the back side too!



Then do the same on the remote side too!

Meanings of the LEDs

Power:

The head is powered up.



-RX :

Only for manufacturing, and calibration purposes. Not effecting link functionality

Level LEDs:

The function of these 10 green LEDs is to give visual information about the incoming light efficiency

Installation LED:

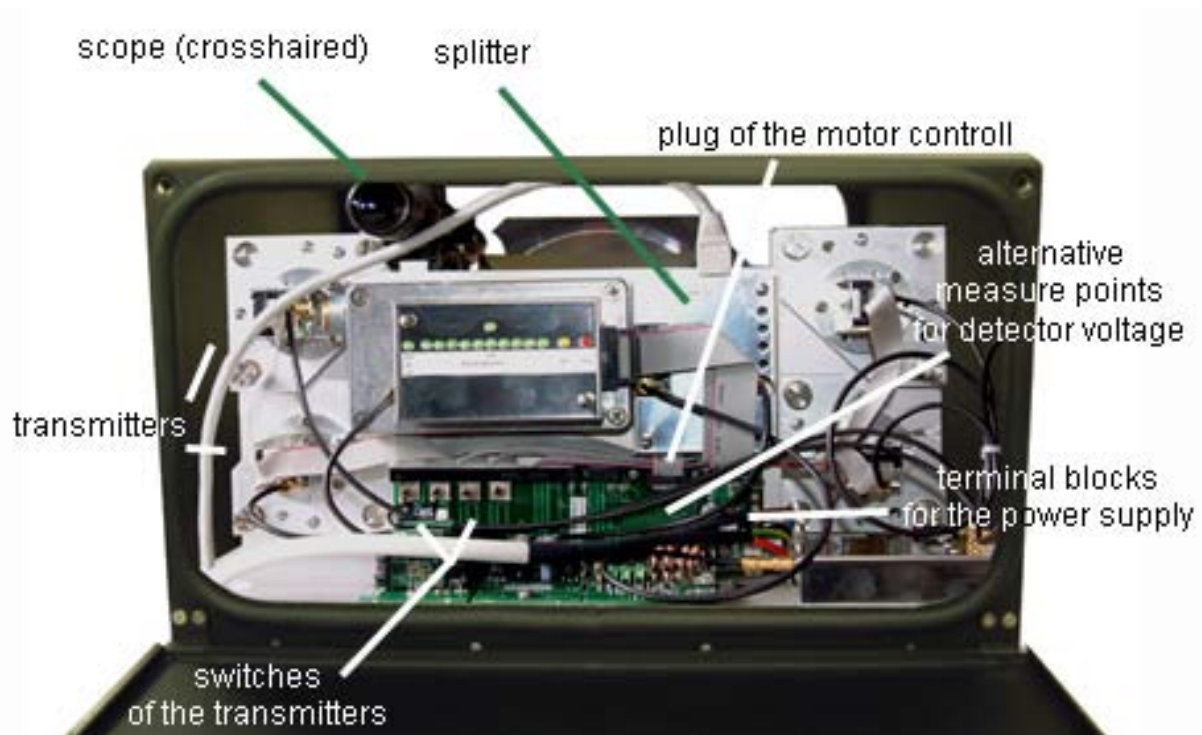
It signs you have the biggest amount of incoming light efficiency which is still not overloads the receiver

Saturation:

Overload (Overloading can cause stop in the communication, and permanently it can damage the receiver)

After 15mW (or higher) incoming light efficiency

- Open up the heads



- Power up the heads!

Receiver Alignment

- After a few seconds unplug the plugs of the motor controllers on both sides!

The motor control is a "light-buffer" this saves the power for the bad weather and in the same time protects the receiver against overload. During the alignment it can be used manually, to avoid the saturation, and keep the detector voltage on the level where it can be still monitored. The detector voltage can be increased to seven volts; above seven volts you won't be able to monitor the detector voltage. This plate is located in front of the receiver, and you can rotate it (clockwise decreases the detector voltage, counter-clockwise increases).

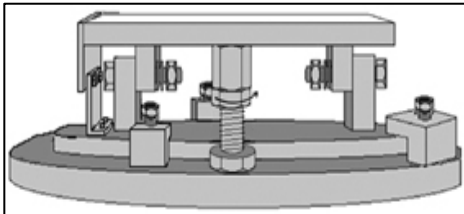
- Follow the steps below
 - 1 Switch on one of your transmitter on one side, and switch off all the others. Switch off the transmitters on the other side too.

Orders of the switches:

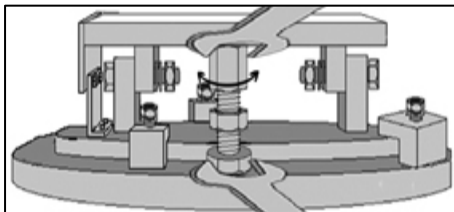
You can check which transmitter is in use, after you switched on one of the switchers, with the green LED on the back of every transmitter. Each LEDs are indicates if them transmitters are functioning, and transmitting.

- 2 Move the head with the off switched transmitters until you can get the biggest incoming light efficiency on the other side.
- 3 Fix the head as hardly as you can!
- 4 Repeat this with the other head too.

The receiver alignment should be done on both sides; the requirement is some incoming light from the remote side (at least receive). This alignment will determine the position of the head and in the head the position of the receiver. The idea is similar to the focusing, but the only way to find the focus is to move the head.



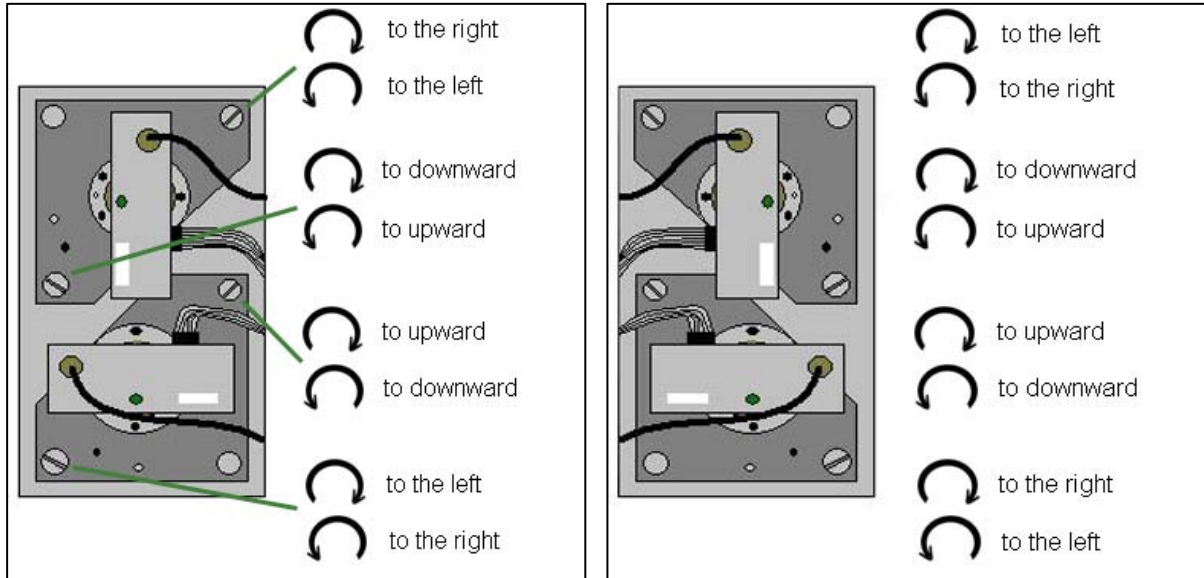
You can check the incoming light efficiency in two ways. Once you can use the LEDs of the receiver. Second is to measure the detector voltage using the two pins on the motherboard (if you have not got management in your head, then the detector voltage is been measurable on the blue and the brown wires of the heads own power cable too).



Because of the weight of the heads for the vertical moving you can use the spacers as it is shown on the figure. For this moving you need two wrenches. With one of them you have to hold the head of the bolt, and with the other you can turn the thick nuts to lift or loose the plate of the ABU. To not enable any movement after the receiver alignment on the vertical angle of the head and due to the heat expansion please close the locking nut under the thick nut, as it shown on the figure, on both sides. Please note before the vertical receiver alignment we strongly suggest doing the horizontal the same way as it is written above

Beam Alignment

- Switch off all of the transmitters on both sides.
- Switch on one of your transmitters on one side.
- Move the beam to the middle of the remote head.

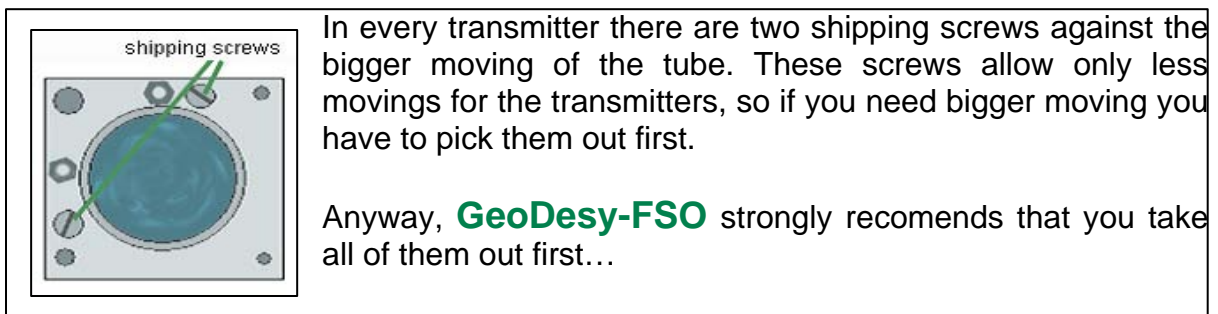


You can move the beam with the screws on the back of the transmitters. The directions of beam moving in the function of the turning direction of the screws can be seen on the figure.

You can check the position of the beam using a digital camera with infrared lenses. You can see the beam shining on the landmarks around the remote head from the side of the transmitter, or until dusk you can see the line of the beam with your own eyes.

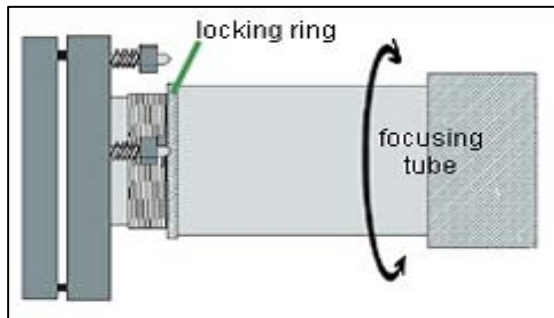
From the remote side you can see the light of the beam behind the head with the shadow of the head on a surface (for example on a wall), or if you see toward the side of the transmitter, there you can see shining the beam on landmarks, and with the growing and declining of the shining rounded plate, which is the beam, you can follow its moving.

- Repeat the beam alignment with each transmitters on both sides



Set the beam size

You can set the beam sizes of each transmitter separately. So do not switch on more than one transmitter in the same time!



You can set the beam size turning the focusing tube. First you have to loose the shipping screws which are functioning as transmitter fasteners, during shipment. Then you have to loose the locking ring which fastens the focusing tube. After that you can manipulate with the beam size turning the tube. If you turn it in clockwise direction the diameter of the beam will

increase, and in counter-clockwise direction the beam size will decrease.

After you set the beam size, do not forget to lock the locking ring and tight up the two shipping screws, but be careful that the transmitter does not move out its position!

To provide the excellent operation you need the following beam sizes:

- On 1500m distance the diameter of the beam should be 1,5 meters!
- On 1750m distance the diameter of the beam should be 1,75 meters!
- On 2000m distance the diameter of the beam should be 2 meter!
- On 2250m distance the diameter of the beam should be 2,25 meters!
- On 2500m distance the diameter of the beam should be 2,5 meters!

You can measure your beam size using a digital camera with infrared lenses. With this you can see the beam behind the head on a surface (for example on a wall) and there you can measure it. In that case if there are not any surfaces for beam measuring, you can do it in the following method:

Face the remote side and check the beam with your camera. Move slowly to the right in straight line until the picture of the beam, what you see in the camera, is reducing, and sign that place. Do the same on the left side. Then you can measure the distance between the two signed places. That will be the diameter of the beam. If you can not use the camera efficiently enough, you can do it with your own eyes too. The method is the same with one difference, the border of the beam is where You cannot see the red dot on the transmitter lens of the remote side.

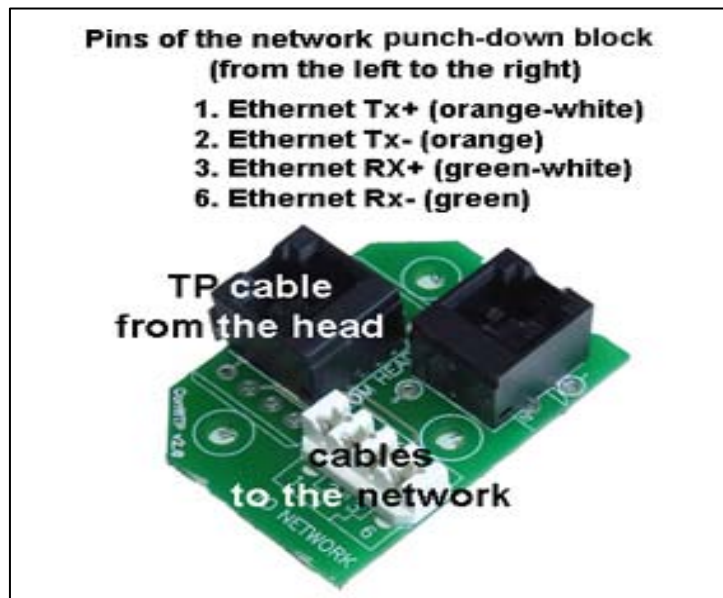
Repeat the setting on both sides with all of the transmitters!

End of the alignment

- Switch on all of the transmitters!
- Plug the motor controller cable back to the slot!
- Close up the covers of the heads!

9.3.5 Connecting to your Network

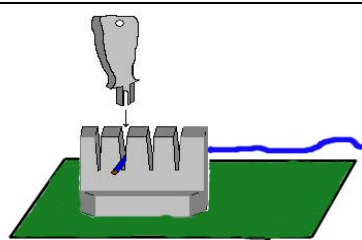
If you have a TP head



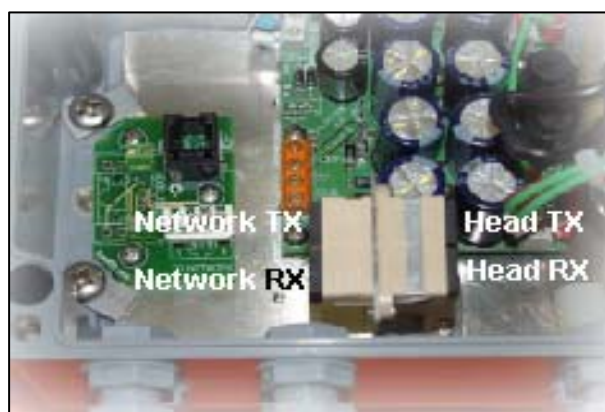
You can find a TP connector unit in your ODIU, with there connectors. You have to plug in the TP cable of your head into the RJ45 connector. Your network is connectable to the GD system using the white one rowed connector, where you have to connect the four cable of your network with the help of the punch down tool. The order of the cable can be seen on the figure.

The punch-down tool

Place your first cable on the top of the chosen connector, without removing the insulator from the cable. Then using the punch down tool push down the cable into the connector.



If you have a TC head



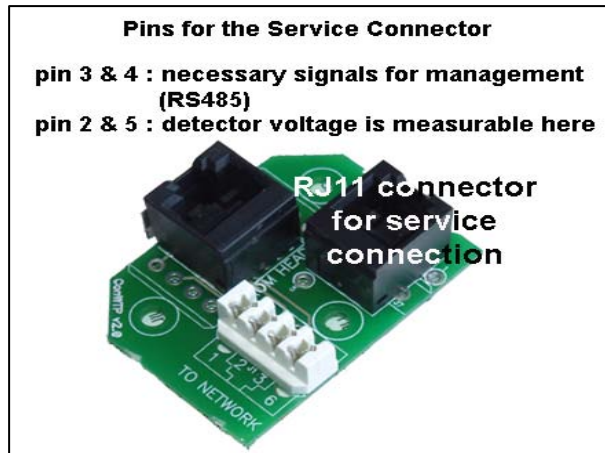
You can find a two sided fibre connector in your ODIU. You have to connect the fibre cable of your head into the one side of the connector, and into the other side you have connect the fibre cable of you network equipment (switch; router or GD combiner). The fibre plugs of the heads are always SC typed, which means that them cross-sections are cubic form. The fibre connector in the ODIU is SC-SC typed, so you have to provide an SC fibre plug for you

network. The SC-SC connector is a reversible part, so you can connect in the first plug where you want, the important is that the two plugs of the head have to be on one side, and the two plugs of the network have to be on the other, and if you plug in the transmitter side of the head into a connector, then the transmitter side of the

network have to be in the opposite connector of the previous, and do the same with the other sides too.

9.3.6 Connecting to the management

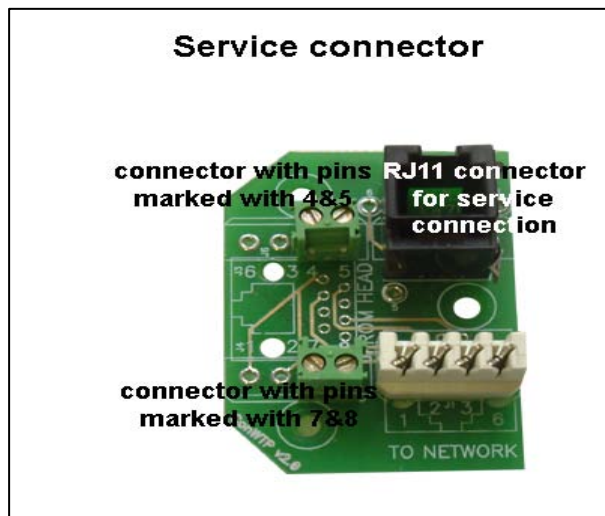
If you have a TP head



Using the RJ11 Service Connector you can connect your management indoor unit to the head, and you can measure the detector voltage of the receiver of the head as well.

More details about the management please find to see its own Users' Manual.

If you have a TC head

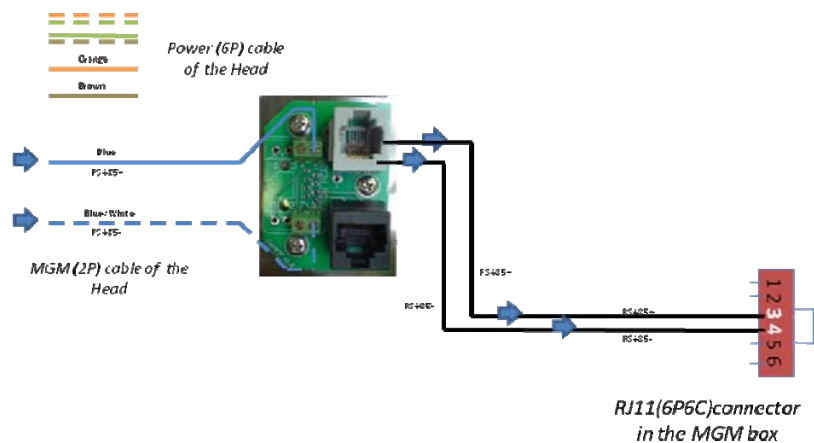


Using the RJ11 Service Connector and the two green connectors you can connect your management indoor unit to the head.

The necessary signals can be found on the blue and brown wires of the head power cable. You have to connect these two wires into two pins of the four of the two green connectors. These pins are connected to the pins of the RJ11 Service Connector. The order of connections is the following:

Pin of the green connector	4	5	7	8
Pin of the RJ11 Service Connector	4	5	3	2

More details about the management please find to see its own Users' Manual.
(please connect the blue and the brown wires to the Pin number 4&7 in case of The Web-Based GD-View MGM unit)



9.4 GD-5000 systems

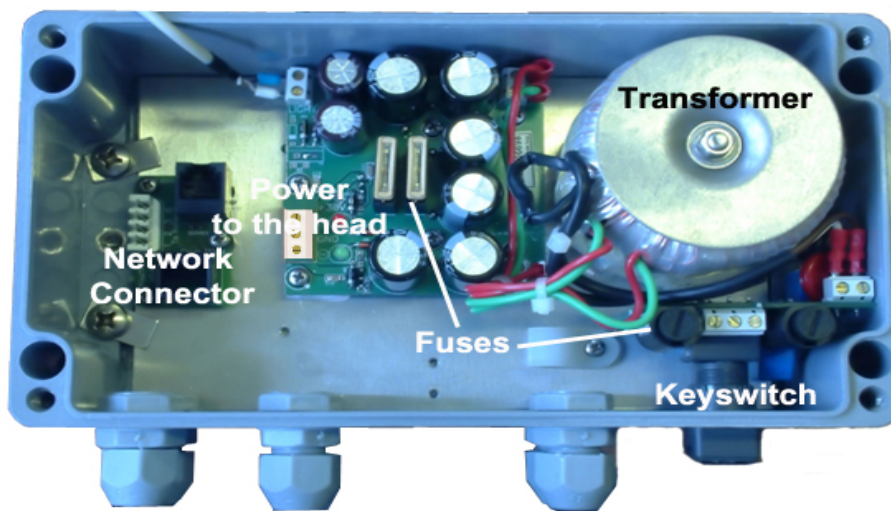
9.4.1 What is GD-5000 about?

The **GD-5000** series products from **GeoDesy-FSO** are laser based free space optical systems designed to provide flexible, reliable and secure solution for high speed wireless connections up to 5000m. Due to their modular design the equipments are easy and fast to troubleshoot and upgrade on the field. Adjustable transmitter optical system allows custom configuration of the system for specific installations. The patented Aperture Control Mechanism delivers outstanding system availability figures. The transparent and wire speed data transfer together with virtually zero latency assures the easy integration of the system in all environments. Furthermore, **GD-5000** series systems can be ordered with IP based SNMP compatible device management that allows remote control and monitoring of the equipment. Because they use infrared light as transmission medium, **GeoDesy-FSO** systems do not require frequency licenses and the transmission is not affected by electro-magnetic interference. The concentrated laser beam is extremely hard to tap, even to discover since it cannot be detected by spectrum analyzers. Basically, a **GeoDesy-FSO** link can be considered as a virtual fibre in the air. For the detailed alignment and power connection description please see the chapters below.

9.4.2 How can you install the ODIU?

Functionalities of the ODIU

The outdoor interconnection unit (ODIU) provides the power supply and data connection for the head. The power connection (+12VDC, GND, -12VDC).



The ODIU made from poly-propylene enforced with fibre. This construction provides robust shock and waterproof environment (IP65) for the electrical devices.

The transformer is a not switch able transformer, so the main voltage must match to the one marked on the front cover. If the main power is different then this can damage the transformer.

In the ODIU there can be found four fuses, two for the transformer and the other two for the head.

Fuses

On the primarily side, the fuse ratings are: T1,6A (250V)
- in the case of glassheater the fuses are T1,6A (250V)

On the secondary side, the fuse ratings are: T10A (250V)

On the glassheater-panel the fuses are T6,3A (250V)

Installing the ODIU box

The physical fixing of the ODIU box can be seen below.

Necessary toolkit:

- Philips screwdriver
- 5mm wrench
- Drilling machine with an Ø8mm bit (the minimum effective length is 50mm)

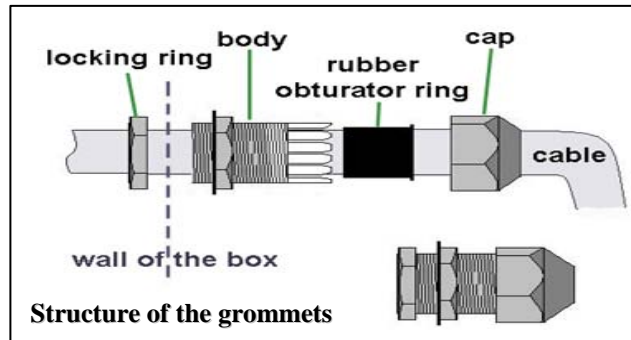
First you have to fix the ODIU box to the metal plate:

- Pick the four M6x70 flat sphere headed screws, and take them to the holes on the corners of the box
- On the back of the box, where the screws came out, you have to put up the four 6x40 spacers (these are the longer ones) to the legs of the screws
- Pull on the metal plate to the legs of the screws
- Fix the metal plate with four M5 nuts using the four washers, and four spring washers like in the figure



Then you can fix the whole construction to a wall:

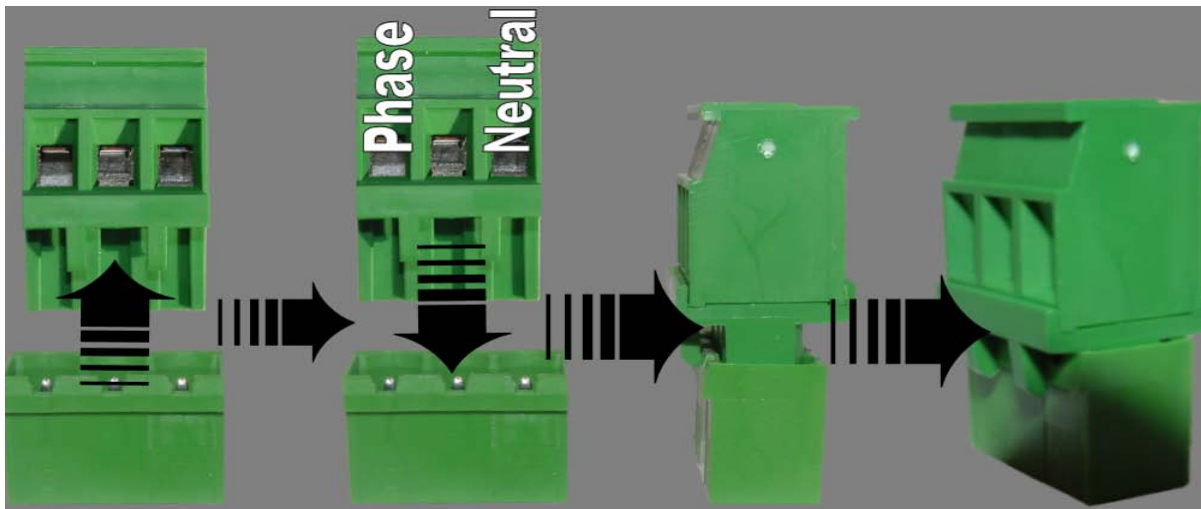
- Drill four holes, using the metal plate for measuring the places of the bores, with a Ø8mm bit. The depth of the bores have to be a minimum of 50mm
- Put the four wall-plugs into the four holes
- Put the four M4,5x70 cross headed self-tapping-screws through the four free holes of the metal plate
- Pull up the four 6x15 spacers (the shorter ones) to the screws
- Tight the screws into the wall-plugs, and tight it up as strong as possible for the appropriate fastening



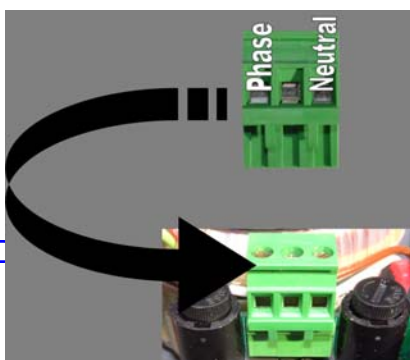
Connecting the head to the ODIU, and the ODIU to the power supply

To make the connection for the 230VAC

9. remove the connector from the slot
10. connect the cables /using the cable shoe/
11. reconnect the connector to the slot
12. secure the connector in the slot /make sure it is seated securely, connectors clips are latched/



For the power connection recommended to use two-wired Ø0,75mm cables.

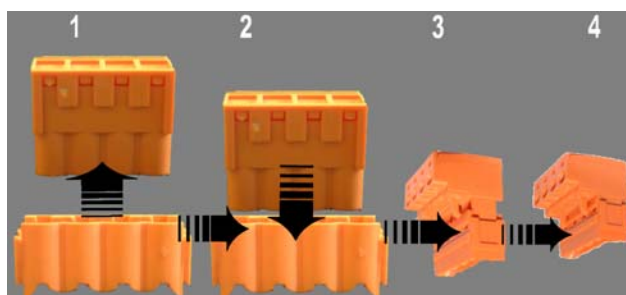


For the power connection recommended to use three-wired Ø0,75mm cables. The order of the connection can be seen on the figure.

- P – Phase
- N – Neutral

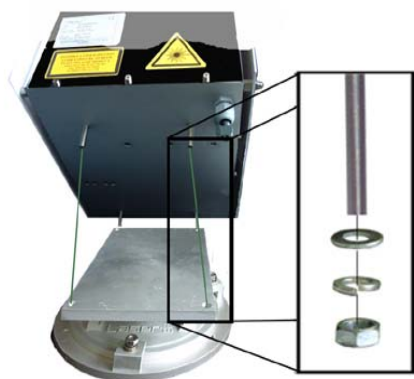
The necessary power can be supported to the head by the connector which can be seen in the figure next to this text. Order of the cables from the head: (the four-twisted-pair-wired cable)

- Not connected
- Red - +12V
- Twisted green-yellow - GND
- Black - -12V



1. Remove the connector from the slot
2. Connect the cables /using the cable shoe/
3. Reconnect the connector to the slot
4. Secure the connector in the slot /make sure it is seated securely, connectors clips are latched/

9.4.3 Fixing the heads



Your **GD-5000** head can be fixed to its stand with an Alignment Base Unit (ABU). On the figure you can see an ABU, and a plinth of a **GD-5000** unit, and the necessary fixing parts. The necessary nuts and washers can be found on the legs of the head. The steps of the fixing are:

- First, fix the ABU to the stand using the washers and nuts
- Place the head to the ABU
- Fix the bolts with the nuts, using the washers
- Tight up all the nuts.

9.4.4 Alignment of the heads

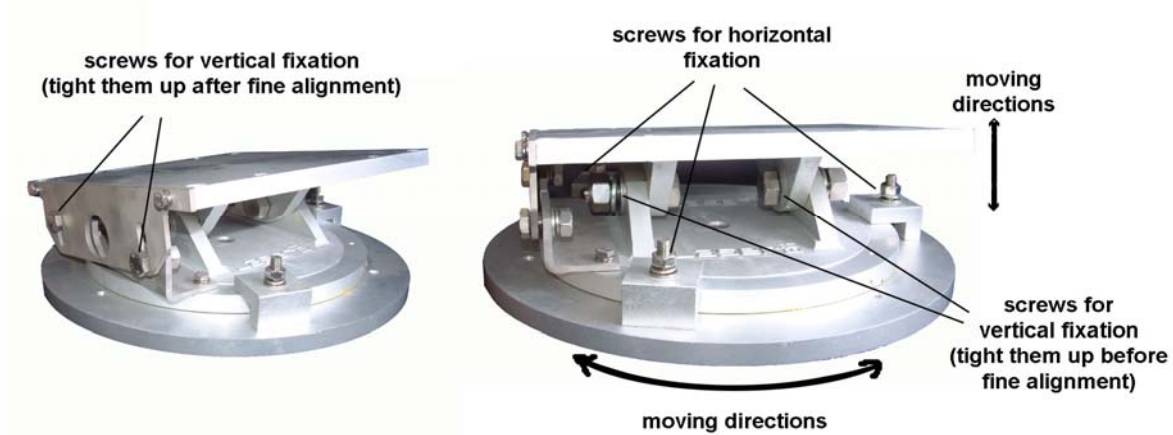
Steps of the head fixation



- Target Side B with the crosshair built in to the head on Side A!
- Screw the two nuts up tight on both heads, which are used for the fixing the vertical direction, but be careful that the heads do not move out from its position!
- Screw the three nuts up tight on both heads, which are used for the horizontal fixation, but be

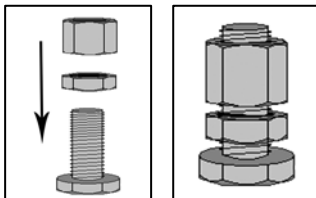
careful that the heads do not move out from its position!

- Repeat this on the other side of the link!

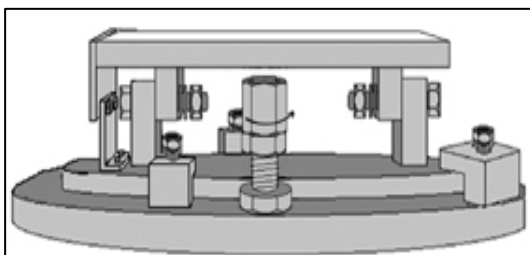


- Place up the spacers on both sides!

Place the two spacers where the figure shows to.



Open the spacers until it reaches the bottom of the upper plate of the ABU! Repeat this on the back side too!



Then do the same on the remote side too!

Meanings of the LEDs

Power:

The head is powered up.



-RX :

Only for manufacturing, and calibration purposes. Not effecting link functionality

Level LEDs:

The function of these 10 green LEDs is to give visual information about the incoming light efficiency

Installation LED:

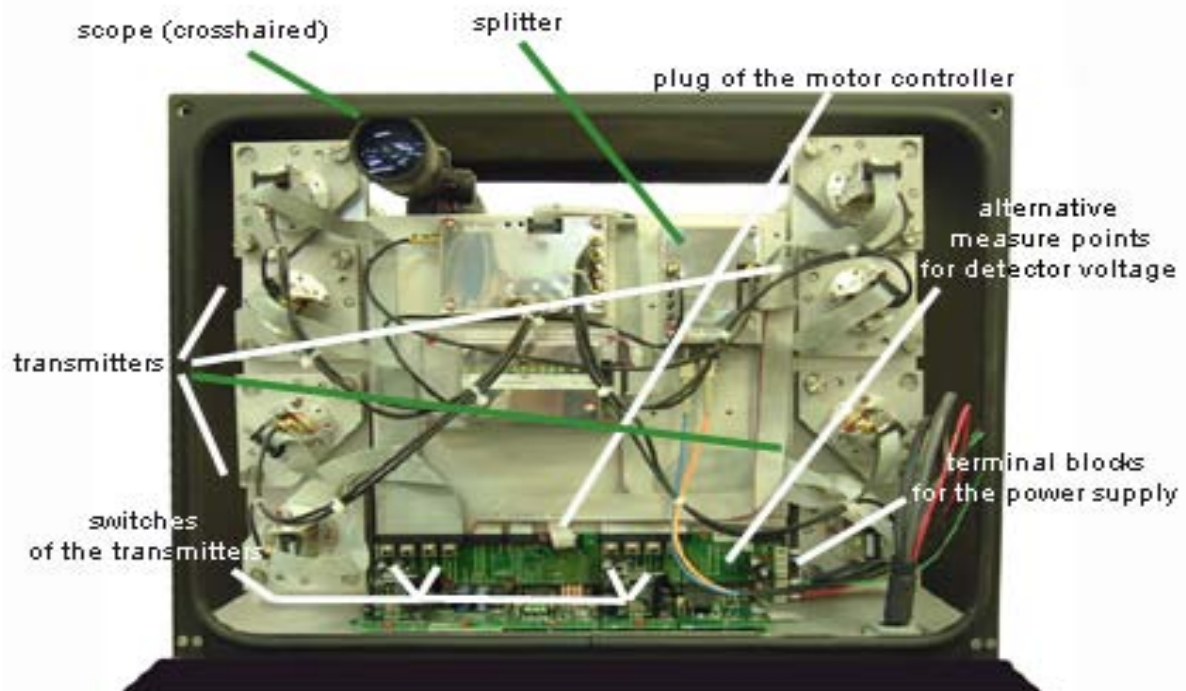
It signs you have the biggest amount of incoming light efficiency which is still not overloads the receiver

Saturation:

Overload (Overloading can cause stop in the communication, and permanently it can damage the receiver)

After 15mW (or higher) incoming light efficiency

- Open up the heads



- Power up the heads!

Receiver Alignment

- After a few seconds unplug the plugs of the motor controllers on both sides!

The motor control is a "light-buffer" this saves the power for the bad weather and in the same time protects the receiver against overload. During the alignment it can be used manually, to avoid the saturation, and keep the detector voltage on the level where it can be still monitored. The detector voltage can be increased to seven volts; above seven volts you won't be able to monitor the detector voltage. This plate is located in front of the receiver, and you can rotate it (clockwise decreases the detector voltage, counter-clockwise increases).

- Follow the steps below
 - 1 Switch on one of your transmitter on one side, and switch off all the others. Switch off the transmitters on the other side too.

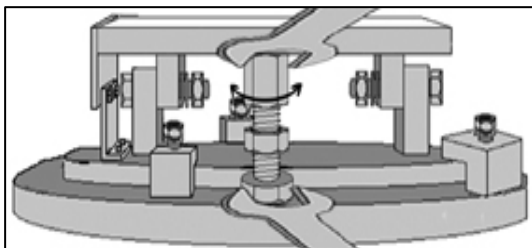
Orders of the switches:

You can check which transmitter is in use, after you switched on one of the switchers, with the green LED on the back of every transmitter. Each LEDs are indicates if them transmitters are functioning, and transmitting.

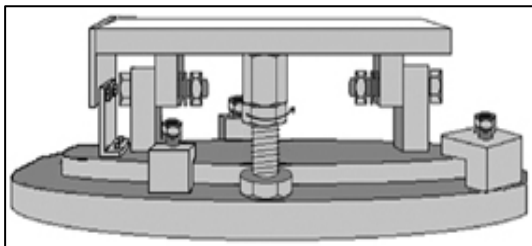
- 2 Move the head with the off switched transmitters until you can get the biggest incoming light efficiency on the other side.
- 3 Fix the head as hardly as you can!
- 4 Repeat this with the other head too.

The receiver alignment should be done on both sides, the requirement is some incoming light from the remote side (at least receive). This alignment will determine the position of the head and in the head the position of the receiver. The idea is similar to the focusing, but the only way to find the focus is to move the head.

You can check the incoming light efficiency in two ways. Once you can use the LEDs of the receiver. Second is to measure the detector voltage using the two pins on the motherboard (if you have not got management in your head, then the detector voltage is been measurable on the blue and the brown wires of the heads own power cable too).



Because of the weight of the heads for the vertical moving you can use the spacers as it is shown on the figure. For this moving you need two wrenches. With one of them you have to hold the head of the bolt, and with the other you can turn the thick nuts to lift or loose the plate of the ABU.

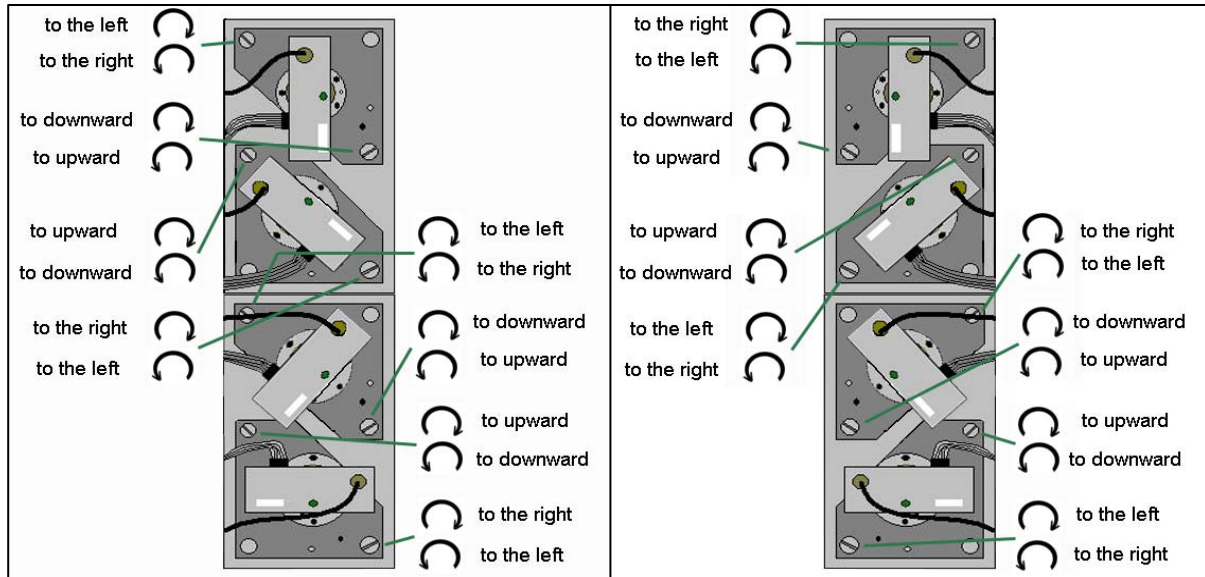


To not enable any movement after the receiver alignment on the vertical angle of the head and due to the heat expansion please close the locking nut under the thick nut, as it shown on the figure, on both sides.

Please note before the vertical receiver alignment we strongly suggest doing the horizontal the same way as it is written above.

Beam Alignment

- Switch off all of the transmitters on both sides.
- Switch on one of your transmitters on one side.
- Move the beam to the middle of the remote head.

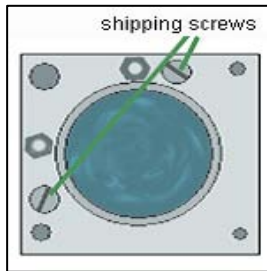


You can move the beam with the screws on the back of the transmitters. The directions of beam moving in the function of the turning direction of the screws can be seen on the figure.

You can check the position of the beam using a digital camera with infrared lenses. You can see the beam shining on the landmarks around the remote head from the side of the transmitter, or until dusk you can see the line of the beam with your own eyes.

From the remote side you can see the light of the beam behind the head with the shadow of the head on a surface (for example on a wall), or if you see toward the side of the transmitter, there you can see shining the beam on landmarks, and with the growing and declining of the shining rounded plate, which is the beam, you can follow its moving.

- Repeat the beam alignment with each transmitters on both sides

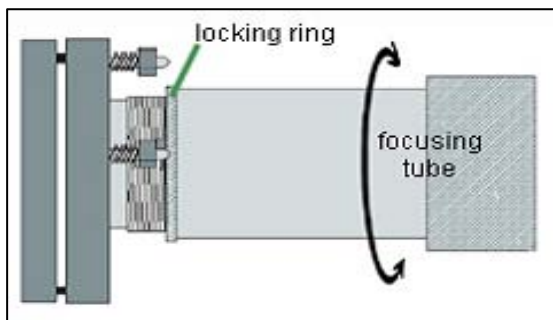


In every transmitter there are two shipping screws against the bigger moving of the tube. These screws allow only less movings for the transmitters, so if you need bigger moving you have to pick them out first.

Anyway, **GeoDesy-FSO** strongly recommends that you take all of them out first...

Set the beam size

You can set the beam sizes of each transmitter separately. So do not switch on more than one transmitter in the same time!



You can set the beam size turning the focusing tube. First you have to loose the shipping screws which are functioning as transmitter fasteners, during shipment. Then you have to loose the locking ring which fastens the focusing tube. After that you can manipulate with the beam size turning the tube. If you turn it in clockwise direction the diameter of the beam will

increase, and in counter-clockwise direction the beam size will decrease. After you set the beam size, do not forget to lock the locking ring and tight up the two shipping screws, but be careful that the transmitter does not move out its position!

To provide the excellent operation you need the following beam sizes:

- On 2500m distance the diameter of the beam should be 2,5 meters!
- On 2750m distance the diameter of the beam should be 2,75 meters!
- On 3000m distance the diameter of the beam should be 3 meters!
- On 3250m distance the diameter of the beam should be 3,25 meters!
- On 3500m distance the diameter of the beam should be 3,5 meters!
- On 3750m distance the diameter of the beam should be 3,75 meters!
- On 4000m distance the diameter of the beam should be 4 meters!
- On 4250m distance the diameter of the beam should be 4,25 meters!
- On 4500m distance the diameter of the beam should be 4,5 meters!
- On 4750m distance the diameter of the beam should be 4,75 meters!
- On 5000m distance the diameter of the beam should be 5 meters!

You can measure your beam size using a digital camera with infrared lenses. With this you can see the beam behind the head on a surface (for example on a wall) and there you can measure it. In that case if there are not any surfaces for beam measuring, you can do it in the following method:

Face the remote side and check the beam with your camera. Move slowly to the right in straight line until the picture of the beam, what you see in the camera, is reducing, and sign that place. Do the same on the left side. Then you can measure the distance between the two signed places. That will be the diameter of the beam.

If you can not use the camera efficiently enough, you can do it with your own eyes too. The method is the same with one difference, the border of the beam is where You cannot see the red dot on the transmitter lens of the remote side.

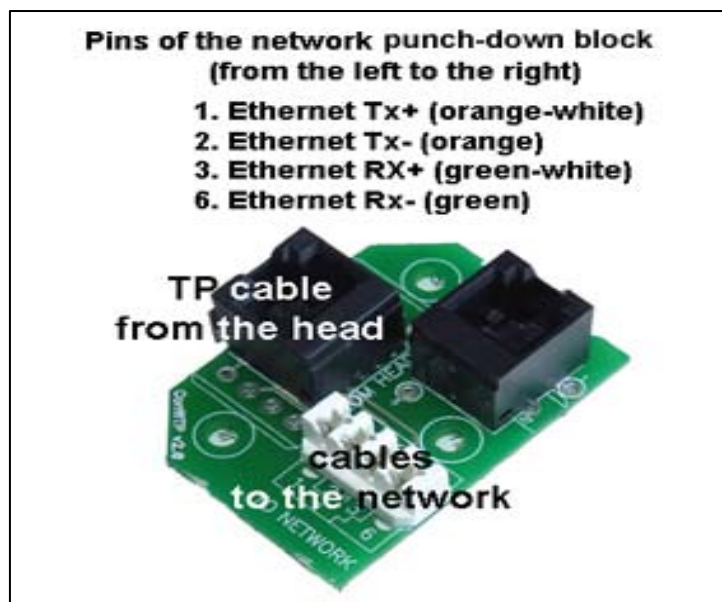
Repeat the setting on both sides with all of the transmitters!

End of the alignment

- Switch on all of the transmitters!
- Plug the motor controller cable back to the slot!
- Close up the covers of the heads!

9.4.5 Connecting to your Network

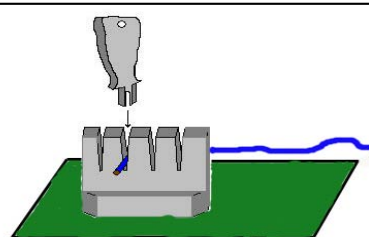
If you have a TP head



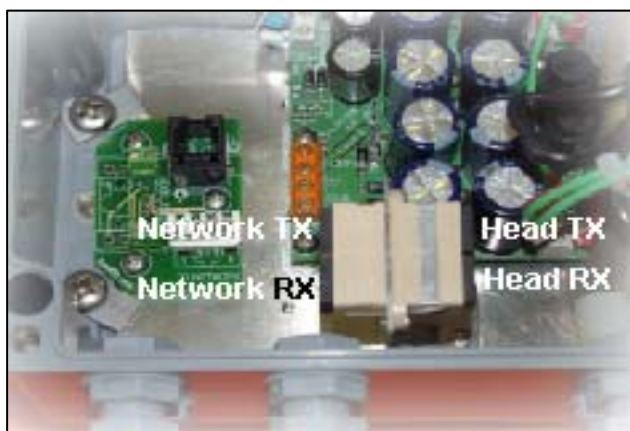
You can find a TP connector unit in your ODIU, with there connectors. You have to plug in the TP cable of your head into the RJ45 connector. Your network is connectable to the GD system using the white one rowed connector, where you have to connect the four cable of your network with the help of the punch down tool. The order of the cable can be seen on the figure.

The punch-down tool

Place your first cable on the top of the chosen connector, without removing the insulator from the cable. Then using the punch down tool push down the cable into the connector.



If you have a TC head

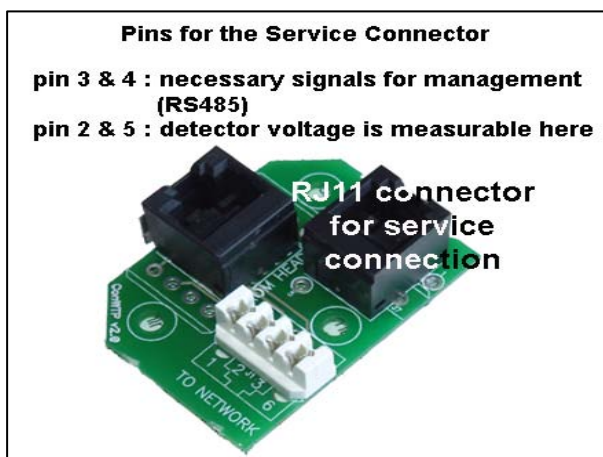


You can find a two sided fibre connector in your ODIU. You have to connect the fibre cable of your head into the one side of the connector, and into the other side you have connect the fibre cable of you network equipment (switch; router or GD combiner). The fibre plugs of the heads are always SC typed, which means that them cross-sections are cubic form. The fibre connector in the ODIU is SC-SC typed, so you have to provide an SC fibre plug for you

network. The SC-SC connector is a reversible part, so you can connect in the first plug where you want, the important is that the two plugs of the head have to be on one side, and the two plugs of the network have to be on the other, and if you plug in the transmitter side of the head into a connector, then the transmitter side of the network have to be in the opposite connector of the previous, and do the same with the other sides too.

9.4.6 Connecting to the management

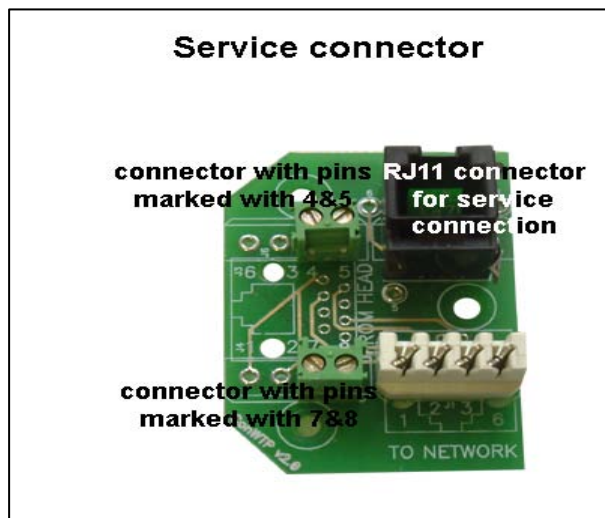
If you have a TP head



Using the RJ11 Sevice Connector you can connect your management indoor unit to the head, and you can measure the detector voltage of the receiver of the head as well.

More details about the management please find to see its own Users' Manual.

If you have a TC head

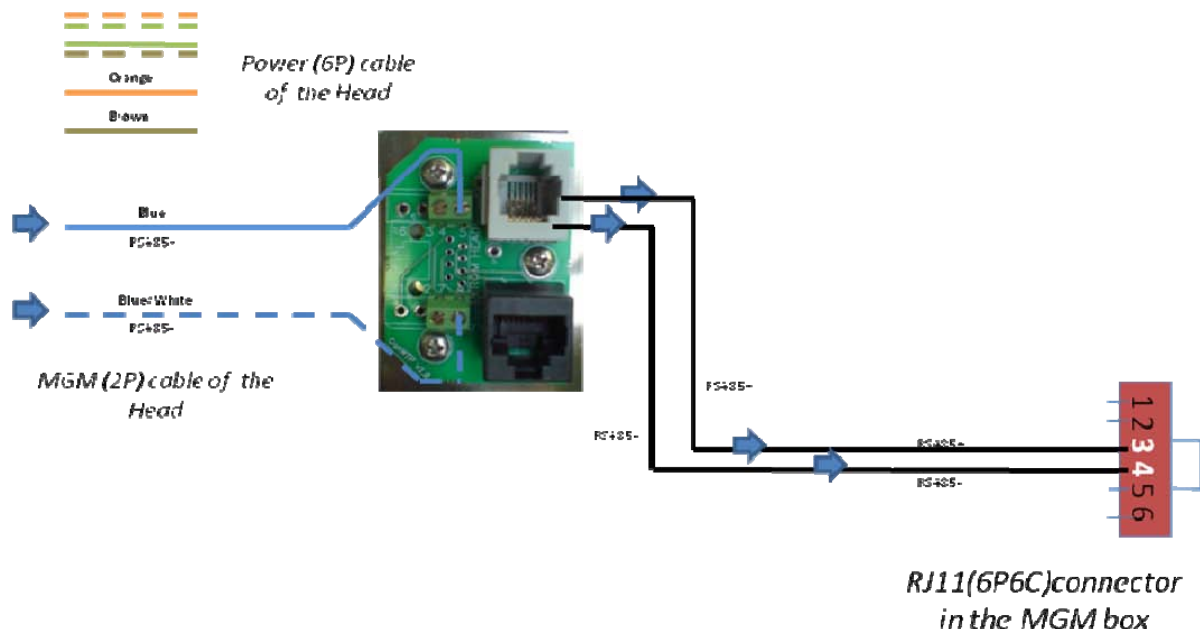


Using the RJ11 Service Connector and the two green connectors you can connect your management indoor unit to the head.

The necessary signals can be found on the blue and blue-white wires of the head power cable. You have to connect these two wires into two pins of the four of the two green connectors. These pins are connected to the pins of the RJ11 Service Connector. The order of connections is the following:

Pin of the green connector	4	5	7	8
Pin of the RJ11 Service Connector	4	5	3	2

More details about the management please find to see its own Users' Manual.
(please connect the blue and the blue-white wires to the Pin number 4&7 in case of The Web-Based GD-View MGM unit)



Outdoor interconnection unit with Heater

As an optional glass heater can be ordered for the link, the idea is the same what is used for the cars back window heater. This automated heater turns on and removes the ice from the front window only below 5 °C(±2°C). It turns of only if the temperature goes above 10°C. If the heater is in use you will see a small yellow LED lighting on the power circuit board.



Slot(top to bottom)	Colour code
+ PSU in(Factory preset)	Black
- PSU in(Factory preset)	Black
Sensor1	Black
Common	Black
Sensor2	Not connected
Output for Heater	Blue
GND	Brown

Three versions exist depending on the system configuration. There are no differences in the connection can be seen below. J1 terminal block is the power connector for the heater panel. This can be depending on the version 12VAC, 12VDC, or 8,5VDC. This panel senses the temperature based on the sensor glued to the front window, and turns on the glass heater or turns it off. The sensor is connected with two black wires to J3 as it can be seen on the picture. The connection is simple connect one of the black wires into the middle slot on J3 and the other one right next to it to Sensor 1. The polarity doesn't make any difference, in the operation. Please note that one of the black wires must be connected into the middle slot on J3.

The heating voltage is connected to J2 with a Blue and a Brown cable, this voltage is switched automatically by the PCB. The glass heater unit is optional for the entire product range, except for the PICO(not available). The ODIU size is bigger in case of the Pinto, Pronto, GigaPico, Giga Pinto, GigaPronto. The size of the outdoor unit 53x100x31(43)mm.

The 12VDC and the 8,5VDC systems are available only for the 48VDC power supply.

9.5 48 VDC Power supply connections

In fact the 48VDC power supply is optional; the connection is almost the same. In the case of the 48VDC power supply it is important to pay attention to the polarities.



The wrong polarity of the cables can damage the power supply.

In this type of ODIU you can find fuses only on the primary side of the transformer.

Type	PINTO	PRONTO
fuse	T6,3A(250V)	T6,3A(250V)

In this case you should connect your negative 48V point to the N point of the OIU, and your GND should be connected to the P point.

In this case you have the 3 poles connector for the head power supply for every type of heads. So the connecting order is as follows, which must be followed:

Color coding Pinto:

Not connected	
Green	positive
Twisted: orange-White, Green-White	GND
Orange	negative

Color coding Pronto:

Not connected	
Red	positive
Green-Yellow	GND
Black	negative



Warranty conditions

GeoDesy-FSO warrants that the **GeoDesy-FSO** product purchased will free from defects in material and workmanship for a period of one (1) year from the date of purchase. This warranty period will not be extended by virtue of a repair of the product or a replacement of any component of the product during the warranty period.

This warranty covers only normal commercial use. **GeoDesy-FSO** is not responsible for warranty service should the **GeoDesy-FSO** identification marks, serial numbers or original seals be removed, altered, or broken, or should the product fail to be properly maintained or fail to function properly as a result of any modification, misuse, abuse, improper installation, neglect, improper shipping, damage caused by disasters such as fire, flood, earthquake or lightning, improper electrical current, or service other than by **GeoDesy-FSO** or its authorised partners.

If the **GeoDesy-FSO** product fails to operate as warranted at any time during the warranty period, **GeoDesy-FSO** will repair, or at its option, replace the defective product at no additional charge.

In no event will **GeoDesy-FSO** be liable for any damages including loss of data, lost profits, lost savings, lost business, or other incidental or consequential or indirect damages arising out of the installation, use, maintenance, performance, failure or interruption of the **GeoDesy-FSO** product, even if **GeoDesy-FSO** Communications Corp. has been advised of the possibility of such damage.

If you purchased the **GeoDesy-FSO** product in the United States, some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation may not apply to you.

The purchaser or user shall have the responsibility to give **GeoDesy-FSO** prompt written notice of any warranty claims. If the product was purchased through an authorised partner of **GeoDesy-FSO** notice may be given in writing to that authorised partner in the area in which the product was being used.

The product may be returned to **GeoDesy-FSO** only if it has a Return Material Authorisation (RMA) number. The product must be shipped prepaid, insured and in the original shipping package or similar package for safe shipment. The RMA number must be marked on the outside of the shipping package. Any product returned without an RMA number shall be rejected.

Transportation charges for the return of the product will be paid by **GeoDesy-FSO**, if it is determined by **GeoDesy-FSO** that the product was defective within

the terms of the warranty; otherwise the purchaser or user shall be responsible for costs of return handling and transportation.

If the **GeoDesy-FSO** product does not operate as warranted above, the customer's sole remedy shall be repair or replacement. The foregoing warranties and remedies are exclusive and are in lieu of all other warranties, expressed or implied, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose. **GeoDesy-FSO** neither assumes nor authorises any other person to assume for it any other liability in connection with the sale, installation, use or maintenance of the product.

